Design Engineering

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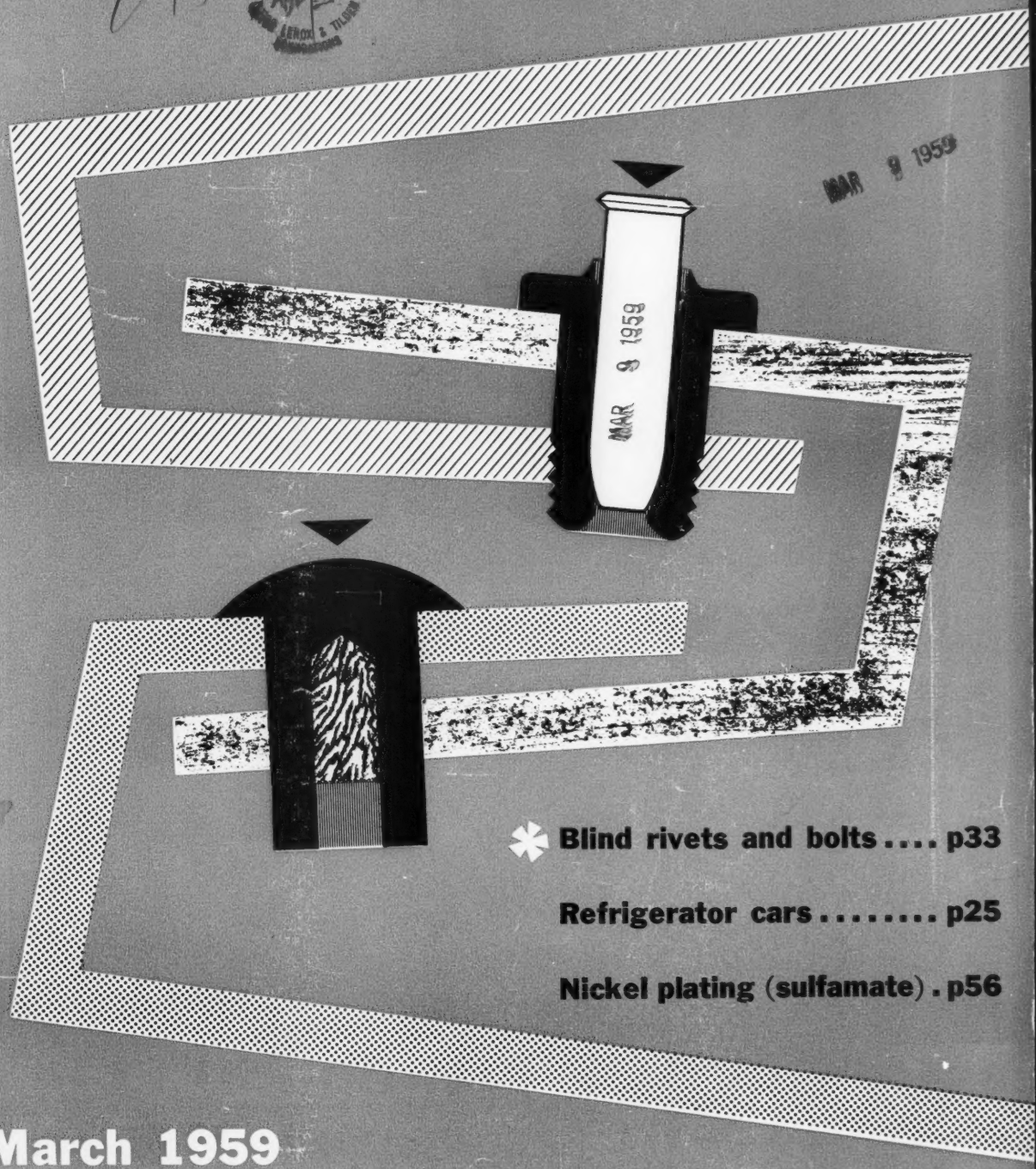

* Blind rivets and bolts p33

Refrigerator cars p25

Nickel plating (sulfamate) . p56

March 1959

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VICKERS
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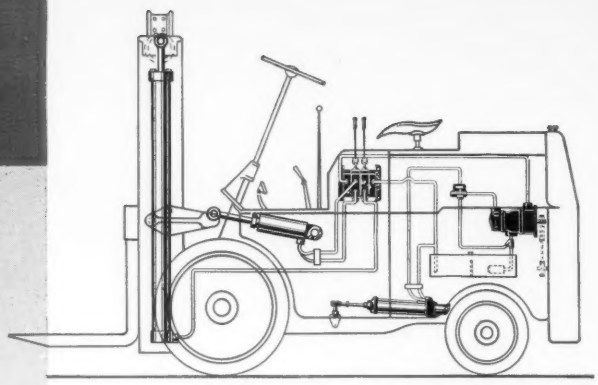
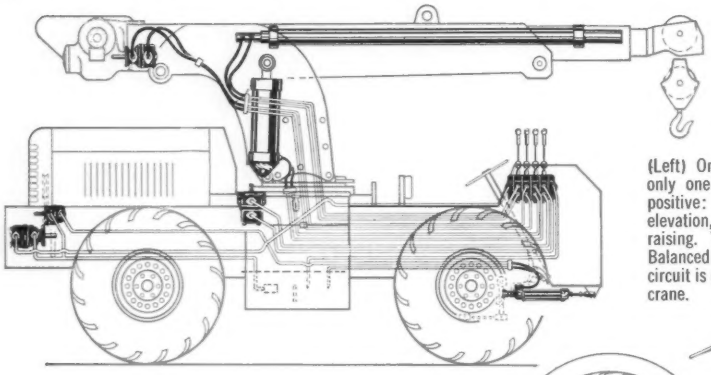
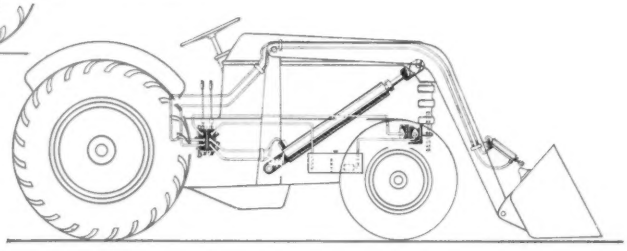
"Nobody sets a diamond in a brass ring." And when a manufacturer of materials handling equipment uses Vickers Hydraulics, it is indicative of superior quality throughout. To the inherent advantages of hydraulic control, Vickers adds the benefits of a nation-wide and full time field engineering and service organization of unequaled experience. Vickers has the complete line of hydraulic equipment necessary to take undivided system responsibility . . . to eliminate any risk of incompatibility of hydraulic components. For further information, ask for new Bulletin M5101A.



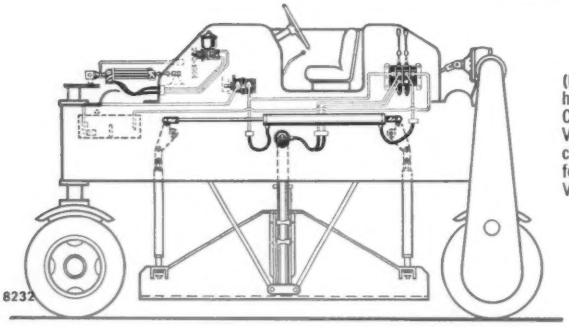
(Above) Fast tilting and lifting are possible along with exclusive "feathering" ability. Also, fingertip power steering permits operator to maneuver vehicle with one hand and control loading operations with the other. Additional vehicle attachments can be hydraulically controlled by simply adding sections to existing control valve eliminating necessity of mounting separate valves.



(Left) One Vickers Hydraulic System (using only one pump) provides fast, smooth and positive: (1) turntable rotation, (2) boom elevation, (3) boom extension, and (4) load raising. Turntable is driven by a Vickers Balanced Vane Type Fluid Motor. Another circuit is used for power steering this hydraulic crane.



(Right) Fast, easy and dependable operation of front end loader depends upon Vickers Balanced Vane Pump and Vickers Two-Section Directional Control Valve. Automatic wear compensation is inherent in all Vickers Balanced Vane Type Pumps. Note simplicity of installation.



8232

(Left) Straddle carrier uses hydraulic power to handle the load with precision and speed. Compact, two-section Vickers Multiple Unit Valve has double-acting valve for opening and closing load hooks and single-acting section for raising load. Separate circuit provides Vickers Hydraulic Power Steering.

WRITE FOR BULLETIN M5101A

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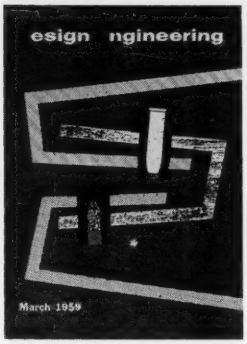

Design Engineering

Vol. 5 MARCH 1959 No. 3

This month's cover

Without wishing to offend the honorable chaps in the business, we'd say that trying to get a cover theme out of blind rivet manufacturing is a bit of a prosaic affair. So we tossed the assignment to artist Gerald Bern and instructed him to ruminate, germinate and fabricate. Above is a miniature of the result. Has he been successful?

Design Engineering

MEMBER

CCAB

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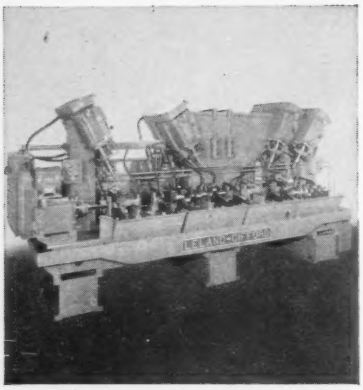
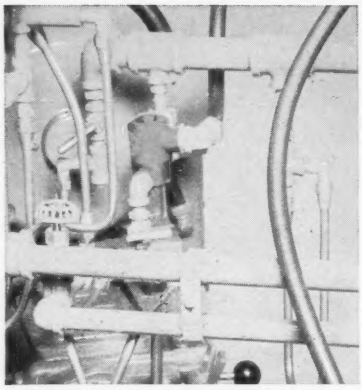
VDA DESIGN

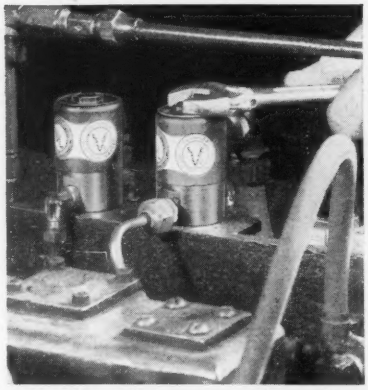
Why Skinner V5 solenoid valves are solving so many control problems



Application: The Leland-Gifford nine-unit hydraulic drilling machine used for drilling crankshafts uses two-way Skinner V5 valves to control the flow of coolant at each operating station of the fixture.

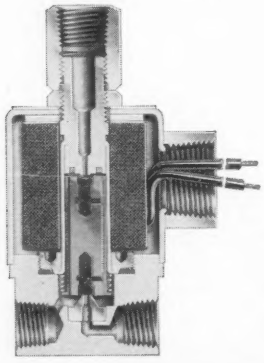


Automatic coolant operation: The Skinner V5 2-way normally closed valves are wired so that at the start of the drilling operation the valves are energized causing coolant to flow before the drill starts its drilling pass. When the cycle is complete the drill retracts, the valves are de-energized and the flow of coolant is halted.

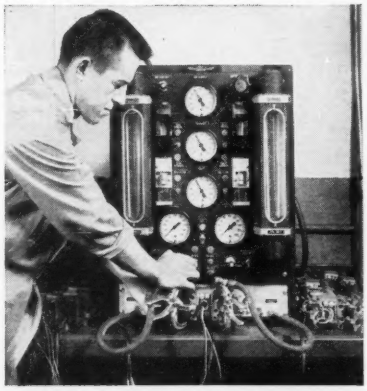


Simple maintenance and repair: The design of Skinner V5 valves permits hand disassembly for cleaning without removal of the valve from the line. Coils, housings, plungers, sleeves are interchangeable and easily replaced.

Skinner stainless steel V5 valves are offered in two- and three-way construction, normally open, normally closed, directional control, multi-directional, quick exhaust. Orifices: 1/32″ to 3/8″; NPT ports: 1/8″, 1/4″, and 3/8″; pressure ratings: to 3000 psi. Explosionproof models UL approved for both Class 1, Group D and Class 2, Groups F and G are available.



Engineered to highest UL standards: Body and internal parts of *frequently copied* V5 valve are stainless steel and, thus, corrosion-resistant. Durable, compressible inserts of soft synthetic materials insure bubbletight operation. Orifice seats have radius with well-rounded contact area and high finish for long insert life.



100% tested. Prior to shipment, every V5 valve is tested for both internal and external leakage under full pressure conditions with modern, sensitive detecting equipment. In these laboratory tests Skinner V5 valves regularly get over 20-million cycles without leakage. And these results are constantly proving out in service.

Skinner has a wide selection of solenoid valves for all types of applications. If you have a control problem, please contact the following Skinner distributors or write us at the address below, Dept. 353.

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People in the news

John W. Holmes of Peterborough has been elected second vp of the Association of Professional Engineers of Ontario. He is a design engineer at Canadian General Electric and is a graduate of the University of New Brunswick.

Dean

Mollot

L. J. Mollot and **R. E. Dean** have been appointed to the new Alchem Ltd., field office in Three Rivers, Quebec. Mr. Mollot graduated from the University of Saskatchewan in chemical engineering and has experience in the paper and pulp industry. Mr. Dean is a McGill graduate in agricultural science and is particularly familiar with the sale and application of specialized chemicals in eastern Canada.

* * *

United-Carr Fasteners Co. of Canada announces that **J. Robert Johnston** has been appointed vp in charge of sales. Mr. Johnston was formerly general sales manager and has been with the company for 22 years.

* * *

Professor Thomas R. Loudon received the coveted Professional Engineers' Gold Medal at the annual meeting of the APEO in Toronto. Prof. Loudon, one of Canada's foremost aeronautical engineers and a pioneer in Canadian aviation, was awarded the medal for his "outstanding achievements in professional engineering."

As Professor Emeritus of civil and aeronautical engineering at the University of Toronto, he retired in 1954 after teaching there for 47 years. As a young man in the early 1900's he was a classmate of J. A. D. McMurdy and Casey Baldwin both legendary figures in Canada's aviation story.

* * *

Two senior executive appointments have

Smith

Demble

been announced by the Dominion Bridge Co. **Thomas Dembie** becomes Chief Engineer and **Duncan N. Smith** takes over as Chief Design Engineer. Mr. Dembie is a graduate of the University of Toronto and has been with the company since 1936.

For several years Mr. Smith was senior engineer at the Toronto operation which he joined in 1926. He is a graduate in civil engineering from Tri-State College, Angola, Indiana.

* * *

John Klassen, a research supervisor at Du Pont's research centre at Kingston, has been appointed technical superintendent of this company's linear polyethylene plant in Sarnia. Dr. Klassen is a native of Kitchener and graduated from Queen's University and the University of Wisconsin, where he obtained his PhD degree. He worked three years with the National Research Council.

* * *

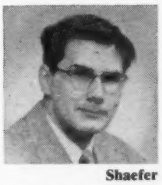
A graduate of University of Toronto in electrical engineering — **A. G. Day** has been appointed executive engineer of Trans-Canada Telemeter Ltd. Until recently, Mr. Day was chief engineer of Station CKCO-TV, Kitchener, and has had 15 years experience in radio receiver design, communications, production and inspection.

* * *

Murray T. Douglas has been appointed manager of the engineering department at Canadian Westinghouse Company's electronics division, Hamilton, Ont. Mr. Douglas was formerly manager of manufacturing, and succeeds Mr. **G. P. Adamson** who was recently named electronics division manager. Taking over from Mr. Douglas is **Ewart O. Bridges** who moves up from superintendent of industrial engineering.

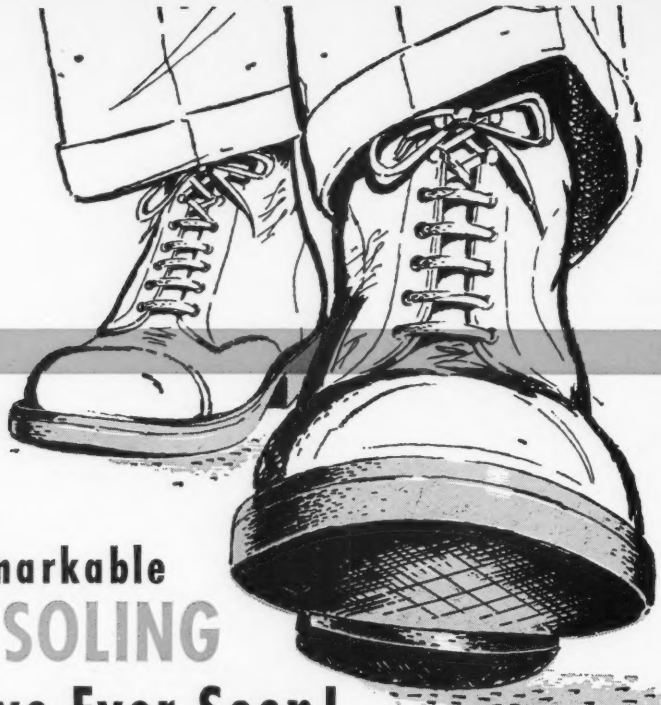
* * *

Chadwick



Shaefer

The first two winners of the overseas scholarship program (inaugurated by the Shell Oil Co. of Canada), recently returned from the U. K. They are **George B. Chadwick** and **Theodore P. Shaefer.** Originally the scholarships were for two years — but the work of these two Canadian scholars was so outstanding, that the scholarships were extended for another year. Dr. Chadwick of Vancouver studied at both Oxford and Cambridge and earned a PhD at the latter university. Dr. Shaefer took his PhD at Oxford; is from Plum Coulee, Man.



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First in the world to develop "cold" butadiene-acrylonitrile rubber, Polymer now offers a range of four Polysar Krynacs for low, medium and maximum oil resistance and processing ease. Write now to the Sales and Technical Service Division, Polymer Corporation Limited, Sarnia, Ontario, for information on the application of Polysar Krynacs.

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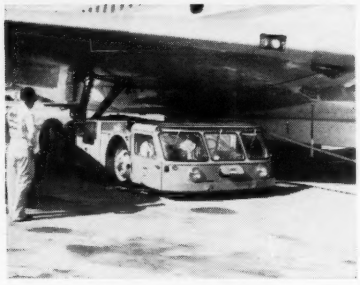
Reports

A news roundup of items of engineering and design interest from the world over

"Did Grandad ever tell you what candles are, honey?"

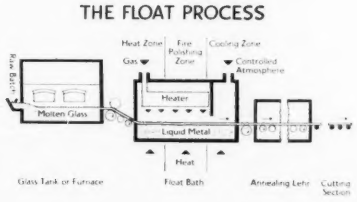
DE is always glad to report about cost reductions. The lamp in front of Grandad gives 15% more light, consumes a frugal 7% more power than lamp it replaces — yet doesn't cost any more. When we spoke with an executive of Canadian General Electric about it (they call it the world's most powerful fluorescent lamp) he said: "It's really a big step forward in attaining higher lighting levels. No, we don't forsee any immediate use of Power-Groove lamps for domestic use. You see its most important applications are for commercial, industrial and street lighting. The grooves? Well in the eight-foot lamp, the arc stream is forced by the grooves to travel an extra foot — or the distance equal to the arc in a nine-foot lamp."

Avast there! Cast off for'ard and let's be away



No, this strange looking craft isn't America's answer to the European small car threat, but a Turbo-Tug. It can chuff up and under the belly of a Boeing 707 (say) and whisk it from passenger ramps to runway before you can say "Tugboat Annie." Weighing a mere 8,000 lbs, the rig is powered by a gas turbine. Friction drive to aircraft tires is provided by rollers located between rear wheels of the mover, so that the pilot is in complete command of all towing operations from the cockpit. A turbine-powered air compressor package supplies starting for jets. It's the only tug we know of that doesn't require "debarnacleizing."

Washing the dishes might get you into "Who's Who"

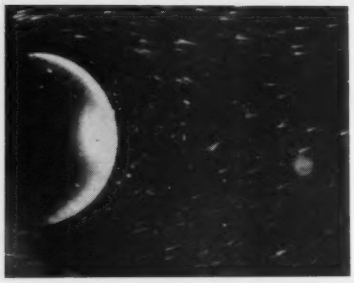


Many great ideas, says history, were germinated during the performance of mundane tasks. Take Newton and the apple for instance—or Ben Franklin and the kite. Well, we've just heard that inspiration came to young Alastair Pilkington of England while he was washing up. Without dropping a dish, he dreamed up a process for producing a high quality glass known as "Float." Basic idea is a continuous ribbon of glass moving out of the smelting furnace and floating along on the surface of molten metal at a controlled temperature through to cut and ship stage. Mr. D. H. Jupp, president of Pilkington Brothers (Canada) Ltd. told DE: "It's really a revolutionary step for the glass industry and we hope to see 'Float' in Canada soon." (Excuse us, we've just spotted a stack of dishes in the kitchen sink.)

Good old George gets a G-note for using his noggin

Just before Christmas we heard that George Reid, master mechanic in Dosco's Sydney, N.S., plant was hauled up before the top brass. "We've heard George, that you've been tinkering around with a stainless steel tipped steam-atomizing open hearth furnace oil burner," they said. And with that Mr. C. N. Murray stepped up to George and handed him a $1000 cheque and a scroll. George's tinkering had really paid off in increased efficiency, construction and maintenance costs. We thought we'd better leave George alone with his money for a couple of months, before asking how he spent it. When we contacted pr-man Larry Doucet, he told us most of George's award had been used to pay for hospital treatment for his daughter. Our sincere good wishes that she gets well soon.

Move over Mr. Moon, this is a fluid research picture



Or how fooled can you be by the camera. The photo shows the patterns formed as water flows past a steel sphere inside a water tunnel. We wanted an "action" photo to illustrate what goes on inside the tunnel. The first looked like an indolent beaver picking its teeth. So we asked for another: still not happy. Then we realized that water tunnel photos are made with a stroboscopic flash unit. The tiny flecks you see are air bubbles, oil droplets or small particles of plastic which are injected into the water stream to make the flow pattern visible. For research purposes, we are told, a water tunnel will produce the same flow patterns when moving about one thirtieth as fast as air. Westinghouse is using the tunnel—which contains 13 tons of water scooting along at 8,000 gals. per minute.

Could this be one of those new-fangled eloping machines?

Swains would find it a lot more convenient than lugging a ladder around on these cold nights, we'll agree. But alas, it has a more mundane application. As a matter of fact it explains itself. The truck rolls up to the side of an aircraft and the gremlins inside load the truck with luggage, freight, mail bags (careful Horace, that was the stewardess), and any other stuff the plane happens to be carrying. And of course the reverse applies too. The truck (a Rootes Karrier Gamecock ¾-ton unit) is proving quite a star turn at London airport and whisks out on the tarmac at first whisper of a turbo-prop. The twin-ram hydraulic hoist by the way, scissors the body as high as 13 ft. Just about the right height for a modern Galahad to rescue his sultry wench from the second floor front of some suburban battlement.

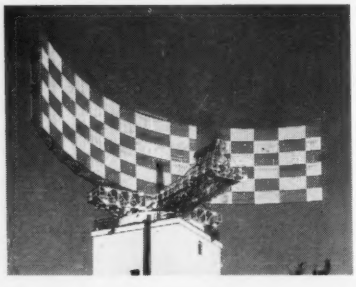
The man with the Arrow in his basement

You'd think by the time a fellow had done his daily eight-hour stint of keeping the wolf from the door, that was enough of his job. At left you see a man who disagrees. Gordon Simpson works in the aerodynamics section of Orenda Engines at Nobel, Ont. His hobby is making scale models of aircraft—and he has so many his basement's bursting out at the joists with them. The 1/20th scale model of the Arrow he's working on will (he hopes) shatter the world's speed record of 107 mph for model aircraft. Power plant is a 4¼ lb static thrust pulse jet engine. Simpson also finds time to operate an aircraft repair and overhaul business south of Parry Sound. This chap *needs* an Arrow to get around.

Canada up-front with aircraft safety systems

Our photograph shows the first four Skyline navigation-aid systems produced and developed in Canada. According to CDC's W. S. Kendall: "The equipment will make a major contribution to airline safety and economy." How does it work? Inputs from the gyro compass and doppler radar are fed to an eight-pound electro-mechanical analog computer. The computer continuously computes the position of the aircraft according to the preselected track. Thus the pilot gets his position reading in terms of miles from start or last turning point; miles to destination or next turning point; and miles right or left of track. Computing Devices of Canada Ltd. developed the equipment.

It can hear a bee thinking 3,794 hives away



Yes it's certainly a whopper—and full of interesting features. For instance the antenna assembly weighs more than 50 tons—but it can be rotated at up to five mph (even in 60 mph winds) and still maintain an accuracy of one-tenth of one degree. The reflector is 120-ft wide by 30-ft high and unlike most radars the antenna (as you can see) is mounted on a heavily reinforced concrete tower. Inside are transmitter, receiver, workshop and offices. The power tube of the transmitter is a ten-foot klystron, and the four-point-contact azimuth bearing is 13½ ft in diameter. Then there are 110 other bearings matched to one-thirtieth the thickness of a human hair. The big ear is in North Andover, Mass., and was developed by the Lincoln Laboratory of MIT.

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Mr. B. C. Lassner, President, (right) discusses the properties of special Anaconda wire produced for the manufacture of Clix Fasteners with Mr. B. S. Buckle, Anaconda Sales Representative.

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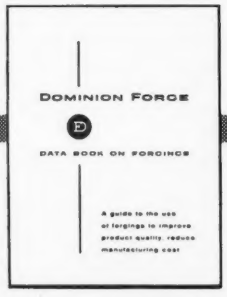
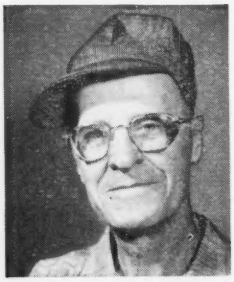
While Dominion's forging and auxiliary facilities cannot be matched for versatility by any other commercial forge on the continent, that's simply a guarantee of service. Dominion's insistence on a standard of quality unsurpassed in its industry is what assures a consistency of quality that is equally unsurpassed. It's a big *extra*. A big extra that adds up to a better, stronger, safer product. *A big extra that costs you nothing extra!*

Your Dominion Forge *forging engineer's* first responsibility is to help you get *all* the extras in forgings Dominion delivers. Put his training and experience to work for you. You'll find it pays.


DOMINION FORGE
DATA BOOK ON FORGINGS
A guide to the use of forgings to improve product quality, reduce manufacturing cost

FREE! Handy informative guide that ought to be at your elbow. Dominion Forge's **DATA BOOK ON FORGINGS,** packed with useful facts, illustrates and describes Dominion's unique facilities. Write for your free copy. No obligation, of course.



DIE SINKER Ernie Berthiaume is one of over 125 members of Dominion Forge's Quarter Century Club—an aggregation of forging experience on which you can count.

DOMINION FORGE LIMITED

MEMBER: DROP FORGING ASSOCIATION

2480 Seminole Street, Walkerville, Ontario, Canada
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Circle number 116 on time saver card

This new Guide to Gear Lubrication saves time, money and headaches

FARVAL—
Studies in Centralized Lubrication
No. 195

● If you design, build or use equipment with large gears, you will want Bulletin 60-A. Its 8 pages provide full information on Farval Spray Lubrication Systems available for manual or automatic operation.

Farval Spray Valves are completely flexible. They can be used alone, in panel set-ups mounted on gear housings, or as part of a Farval Dualine System—wherever compressed air is available. As with standard Dualine valves, the spray can be operated as often as needed to deliver any amount of oil or grease—on gears, slide surfaces or other areas needing lubrication.

Thousands of Farval Spray Valves are used in many industries. You, too, should enjoy their benefits. Write today. You will receive a copy of Bulletin 60-A and the address of the Peacock representative in your area who can help you select the proper equipment for your machines. Peacock Brothers Limited, P.O. Box 1040, Montreal 3, Que. Branches in Sydney, Toronto, Sudbury, Winnipeg, Edmonton, Calgary, and Vancouver.

Proved in 30 years of service, Farval manual and automatic centralized lubrication systems protect millions of industrial bearings. Wherever you see the familiar Dualine valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated.

FARVAL
CENTRALIZED SYSTEMS OF LUBRICATION

Sold in Canada by...

PEACOCK BROTHERS LIMITED

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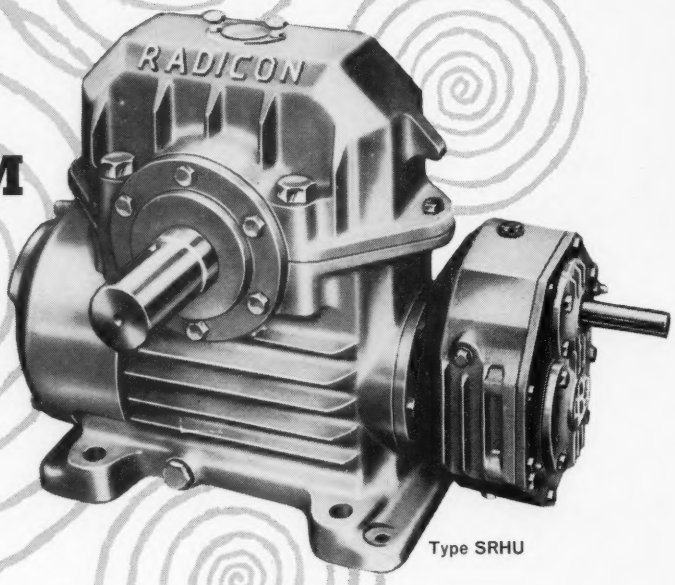
NOW-IN RATIOS OF 5/1 TO 250/1

RADICON HELICAL-WORM REDUCERS



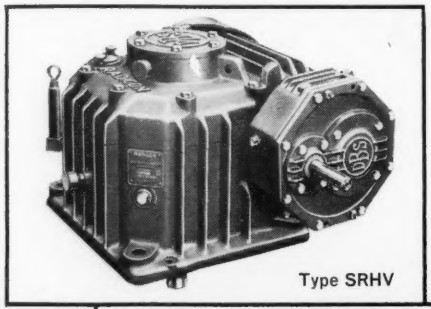
Type SRHU

New David Brown Helical Unit mounted on standard Radicon, permits speed reductions of up to 250/1 with high efficiency.

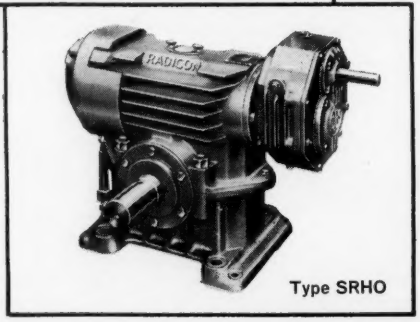
Standard Radicon units are also available as usual in a complete range, fractional and integral up to 100 H.P. ratios from 5/1 to 60/1.

NO WAITING!

Now available for **immediate deliveries from stock**



Type SRHV



Type SRHO

Write for complete information, prices and literature to:

IN EASTERN CANADA

DAVID BROWN (CANADA) LIMITED

Toronto 1550 O'Connor Drive, PL. 7-3651 Telex: 022518

Montreal 172 Clement St., Ville La Salle, Que. HU 9-7293 — Telex: 012511

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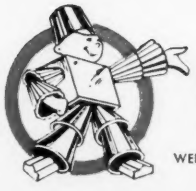
STAN STEEL TUBING

STARTING POINT FOR A NEW LOOK

People are the real difference between products, because of one precious ingredient — imaginative planning. New advancements, new improvements in product design are all possible through the versatility of welded steel tubing.

If it's improved performance ratings, lower assembly costs, or better product appearance wanted, your starting point can be STAN STEEL tubing. Please consult with us.

STANDARD TUBE STANDS FOR ALUMINUM TOO! Sheet, Bar, Extrusions, Tube and Wire—available in any quantity.



Write or phone for immediate service

STANDARD TUBE AND T. I. LIMITED

WOODSTOCK • HAMILTON • TORONTO • OTTAWA • MONTREAL

WELDED AND SEAMLESS STEEL TUBING • MATERIALS HANDLING EQUIPMENT • SCHOOL AND NESTING FURNITURE

Member of Formed Steel Tube Institute H-8394

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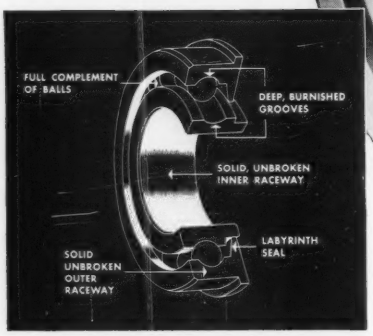
a low cost ball bearing of superior quality and greater durability

HEIM *Unibal*® BALL BEARINGS



Note this unusual construction. There is no other ball bearing like it!

Suitable for requirements ranging from the commercial field to many precision applications heretofore using conventional ground ball bearings.

Its simplified construction and unusual assembly method produce a bearing which has no loading slots, no split raceways, and no inserts . . . yet there is a full complement of balls for smooth operation and optimum bearing life.

Deep, unbroken, burnished ball grooves. with closer tolerances and improved finish, provide maximum capacity for radial and thrust loads.

Unibal Ball Bearings can be furnished in single row, double row, flanged or snap ring types in a wide range of widths and diameters . . . even down to extremely narrow widths.

Where closed type bearings are required, shields, mechanical or close, integral labyrinth seals on one or both sides are available.

Our Engineering Department will be happy to help you select the correct bearing for your application. Write for UBB folder showing dimensions, load capacities at various rpm.

R&M BEARINGS CANADA LTD.

QUEBEC CITY	MONTREAL	WINNIPEG	THREE RIVERS	TORONTO	VANCOUVER	LONDON, ONT.	HAMILTON
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FACTORY REPRESENTATIVES AND DISTRIBUTORS FOR CANADA

Circle number 122 on time saver card

THIS IS GLASS

A BULLETIN OF PRACTICAL NEW IDEAS FROM CORNING

HOW TO TAKE A SNAPSHOT OF A SATELLITE IN FLIGHT

If snapshooting satellites is on your agenda, contact either Boller & Chivens/-Joseph Nunn, South Pasadena, California, or the Perkin-Elmer Corporation, Norwalk, Connecticut.

In collaboration, these two firms make just what space photographers need. It's called the IGY Satellite Tracking Camera. And, of necessity, it's somewhat larger than the cameras most of you are accustomed to using. Like this.

Twelve of these cameras are now in use around the world. Each is designed to, first, take a picture when fixed on and following the *satellite*. This renders the subjects as a point against a background of streaks from the brightest stars. Then a second exposure is taken with the camera fixed on and moving with the *stars*. This provides the reference for determining the satellite's location.

And us? We provide the mirror blanks for Perkin-Elmer, who in turn handle the complete optical system. (The West Coast firm provides mechanical components and does the assembling.) The blanks we furnish are 31¾″ in diameter and 7″ thick. They are made from glass No. 7160, the very same glass used in casting the now-famous, 20-ton, 200″ disc for the Mt. Palomar Observatory.

The big advantage in using this particular glass is its very low linear coefficient of expansion—23 x 10^{-7} per ° C. Low expansion means a minimum of distortion, a much-appreciated contribution in the complex optics called for in taking pictures of satellites.

These king-sized mirrors lead us quite naturally to remind you that *Corning can do almost anything with glass*. Find out for yourself. Get a copy of "This Is Glass." Use the coupon for quick service.

NEW GIANT GLASS FLASK FOR THE IN-BETWEEN TASK

What intrigues the man in the picture is the *size* of the crystal clear vessel he is examining.

His interest is justified because as far as we know this is the *biggest* all-glass reaction flask on the market. It's new; it measures 18 inches in OD and stands 26 inches high. Capacity is 20 gallons.

We provide this size—along with 5 and 10-gallon versions—for people (maybe you) who need to fill the gap between lab and pilot plant.

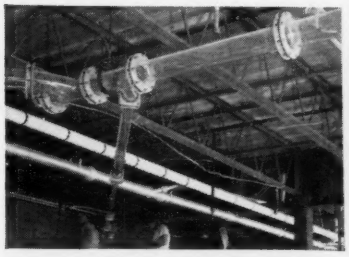
You also can get all the trimmings. Like the five-opening all-glass cover that's visible behind the flask. Such covers can be had with pipe flanges, ⅁, or socket joints. Accessories include inlet tubes, condensers, blind caps, clamps and thermometer wells. Need one? Just write for details.

This outsized glassware is all made from PYREX brand glass No. 7740—a glass that performs admirably because of the virtues detailed elsewhere on this page.

Which brings us to this diminutive and relatively intricate container known as a Warburg flask. It's quite commonplace to biochemists who use it for measurement of cell respiration and tissue metabolism. It's also a stock item with us.

We call the big ones and the little ones *both* to your attention because it points up the fact that size or shape is a consideration—*not* a limitation—to the skilled glassworkers at Corning.

Investigate by tossing us any one of your tough problems. We'll look for a glass answer and let you know soon what we can do.



PLUMBING FOR POSTERITY

An increasingly popular fixture in labs, hospitals, schools, chem plants, and photoengraving shops is the glass drainline.

With good reason. Glass drainlines are fashioned from PYREX brand glass No. 7740.

This is the glass that ends your worries about corrosion. For example, if you were disposing of waste hot hydrochloric acid, your PYREX pipe would still be around at the end of 200 years.

And glass is smooth; very little chance for block-up in the pipe. If such does occur, however, you can spot the exact point and take corrective action, without having to take down the whole system.

In fact, almost anything made from PYREX brand glass No. 7740 will be around for quite a while because this glass is able to cope with thermal shock and physical knocks, too.

Available in many forms—tubing, rod, pipe, plate, and all kinds of shapes.

Fill in the gaps in your files with these basic references: PE-30, all about glass drainlines; IZ-1, design considerations in glass. Any or all, free. Use the coupon.

CORNING MEANS RESEARCH IN GLASS

CORNING GLASS WORKS 39 Crystal Street, Corning, N.Y.

Please send me; ☐ "This Is Glass"; ☐ Drainline Manual, PE-30; ☐ Design Manual IZ-1: ☐ Info on Reaction Flasks

Name_____ Title_____

Company_____

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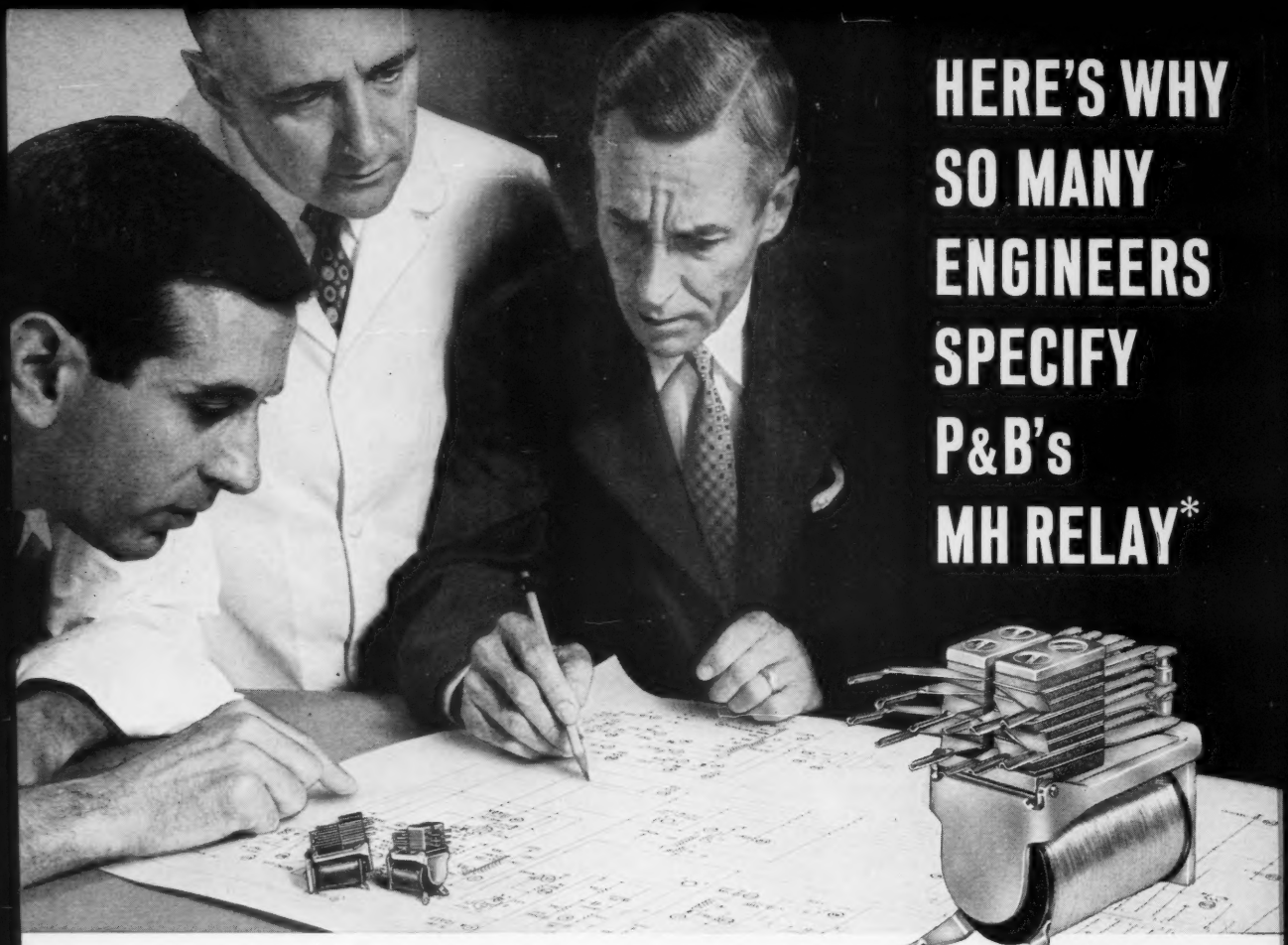


HERE'S WHY SO MANY ENGINEERS SPECIFY P&B's MH RELAY*

*AND VARIATIONS OF THIS BASIC STRUCTURE SHOWN BELOW

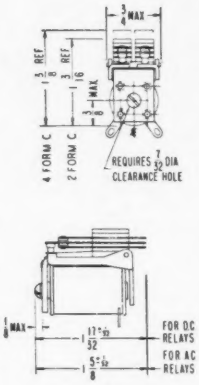
Shown with printed circuit terminals

VERSATILITY

and adaptability are prime reasons why designers have made the MH a P&B best seller. This relay series, for example, does yeoman duty in such diverse applications as jet aircraft, street lighting equipment, computers and missile ground controls.

When multiple switching is required... when size, weight, long life and reliability are critical ...our MH relay can usually fill the bill. It's RIGHT for countless jobs, often at countable savings.

Let us send you complete information about this miniature telephone-type relay and the variations we've evolved for special applications. Write or call today.



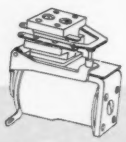
ENGINEERING DATA/MH RELAY

Insulation: Laminated phenolic.
Insulation Resistance: 100 megohms minimum.
Breakdown Voltage: 500 volts RMS between all elements.
Shock: Up to 30g.
Vibration: Up to 10g from 55 to 500 cps.; .065" max. excursions from 10 to 55 cps.
Ambient Temperature: −45°C. to +85°C. −(65°C. to +125°C. on special order).
Weight: 2½ oz. max. (open relay)
Pull-In: Approx. 75% of nominal voltage.
Pull-In Speed: Approx. 15 ms.
Drop-Out Speed: Approx. 10 ms.
Terminals: Pierced solder lugs; special lugs for printed circuits, taper tab (AMP #78).

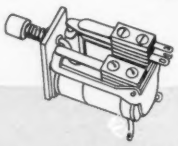
CONTACTS:
Arrangements: Up to 9 springs per stack.
Material: ⅛" silver; also Palladium or gold alloy.
Load: Dry circuits to 5 amps @115V AC resistive.

COILS:
Resistance: 22,000 ohms max.
Power: 100 milliwatts per movable minimum to 4 watts at 25°C. max. (200 mw. min. to meet max. shock/vibration spec.)
Duty: DC: Continuous. AC: Intermittent (2 pole relay max.)
Voltages: DC: Up to 110 volts. AC: Up to 230 v. 60 cycles.
Current: 2.5 ma to 10 amps DC.

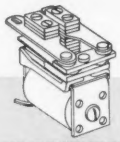
P&B STANDARD RELAYS AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR



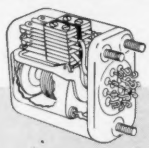
MC FOR RF SWITCHING
For RF switching where intercontact capacitance losses must be minimized. Ceramic contact spacers.



MA LATCHING
Electrical latch; mechanical reset. Small, versatile and offered with selection of contact arrangements.

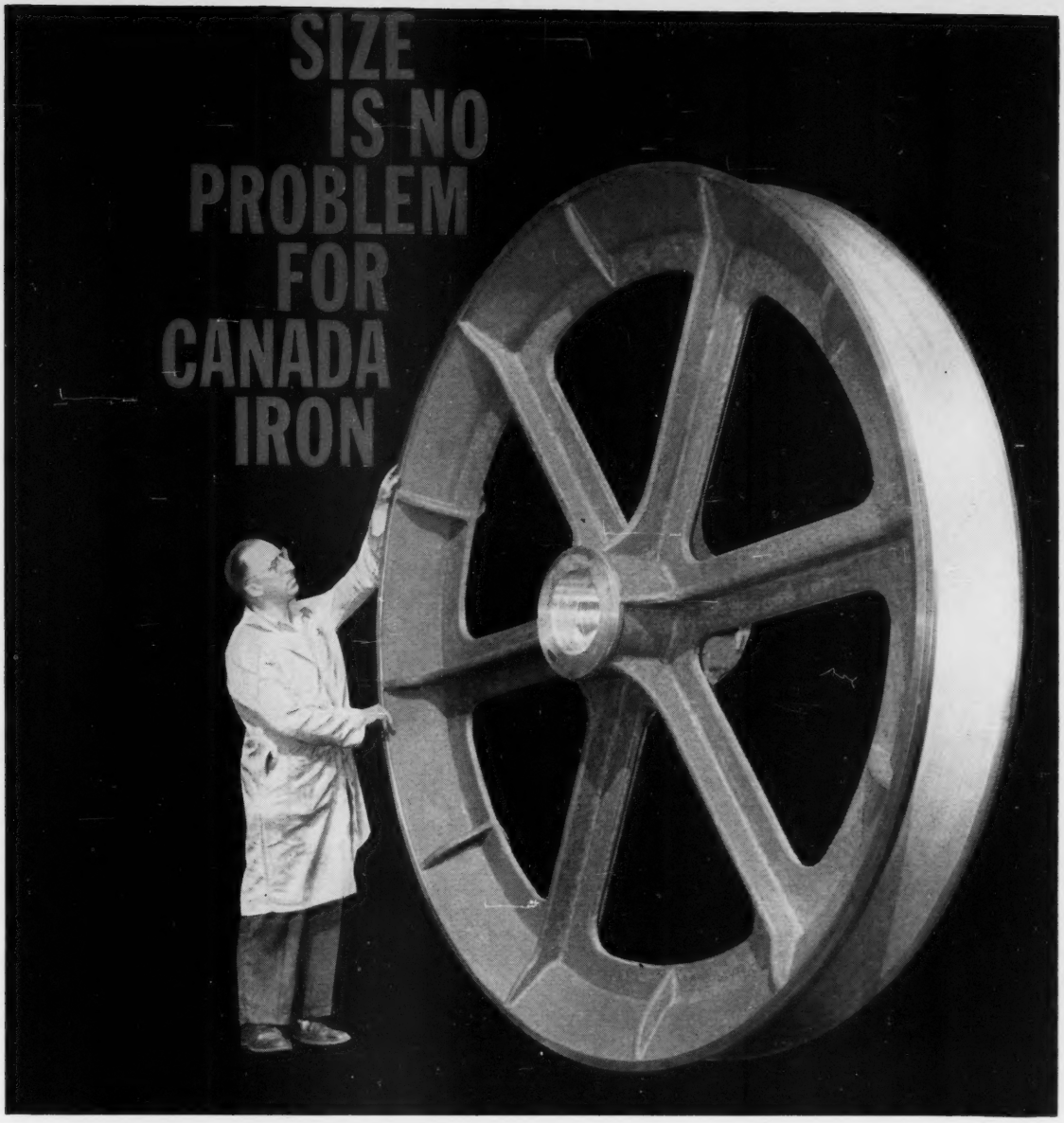


MB CONTACTOR
Contacts rated 60 amp. 28 volts DC non-inductive. Will carry 150 amp. surge for a duration of 0.3 seconds.



MH SEAL-TEMP
Features sealed coil to minimize contact contamination. Available as hermetically sealed relay only.

POTTER & BRUMFIELD CANADA LTD.
GUELPH, ONTARIO



Produced at Canada Iron's Trois Rivières plant, this giant Ductile (Nodular) Iron Sheave is installed on the cable ship repairing trans-Atlantic cables. The sheave is eight feet in diameter, weighing over 3500 pounds, with an inserted cast bronze bushing.

Canada Iron Foundries, Limited specializes in the production of large size castings. This sheave is just one of a host of quality castings produced from high tensile DOMITE* irons and alloys for Canadian industry. Get in touch with your Canada Iron sales representative today; he will recommend the most economical and serviceable grade of metal for your job.

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*Trade Mark Registered

52Q

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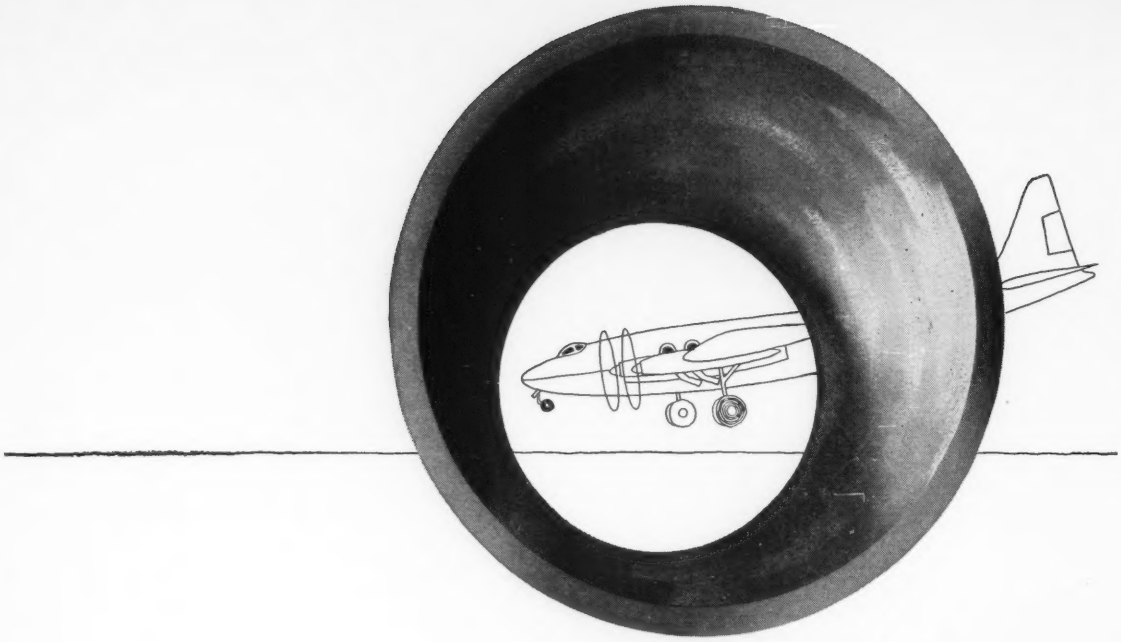

WHAT'S IN A TUBE?

Michelangelo could look at a block of marble and see an angel. What you see in a Chesterfield tube will depend on what you want to make. If for example, it calls for a cold drawn seamless steel roller tube up to 24" internal diameter and manufactured to special close tolerances of ovality, thickness, eccentricity and straightness or a stainless steel extruded section for the aircraft industry—it will pay you to get in touch with ***chesterfield tubes***

THE CHESTERFIELD TUBE COMPANY LIMITED · CHESTERFIELD · ENGLAND · A TI COMPANY

Canadian Representatives: STANDARD TUBE AND T.I. LIMITED · WOODSTOCK · HAMILTON · TORONTO · OTTAWA · MONTREAL

CRC62

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Miniature Soldiers. Army ants carry out intricate maneuvers of wheeling, flanking, and envelopment with faultless precision. Their columns are led by "majors", preceded by "scouts". Raids are conducted by "skirmishers". Between campaigns, they form "bivouacs". Army ants are nature's tiny troopers.

Miniature Ball Resolver, approximately 3⅜" x 2½" O.D. continuously calculates position of aircraft and missiles traveling at supersonic speeds. MPB bearings at critical points keep torque low, and help make possible an accuracy of 0.33 of 1%. This is another man-made miracle in miniaturization.

Man with Miracles. This is Jim Mitchell, Lyman-MPB's technical representative, whose close liaison with the Canadian manufacturer of the ball resolver facilitated its design and development. Through Lyman, you can call on MPB's experienced design consultation service to assist you in your miniaturized miracles.

New Worlds for ○ Miracles in Miniaturization

ACTUAL SIZE OF THE MPB BEARINGS IN BALL RESOLVER SHOWN ABOVE

Every day man's advances, both on this planet and beyond, are opening new and challenging areas of application for miniature components and mechanisms. And at each step forward, MPB is ready to help with research, engineering and manufacturing facilities unsurpassed in the miniature bearing industry. MPB makes more than 500 types and sizes of bearings ranging from ⅜" O.D. down . . . designed to meet requirements of the most exacting nature. Specials are developed on request. For a confab on design problems or our latest catalog write MPB distributor: Lyman Tube and Bearings, Ltd., 920 Ste. Sophie Lane, Montreal. Additional offices: Toronto, London, Winnipeg, Vancouver and New Glasgow.

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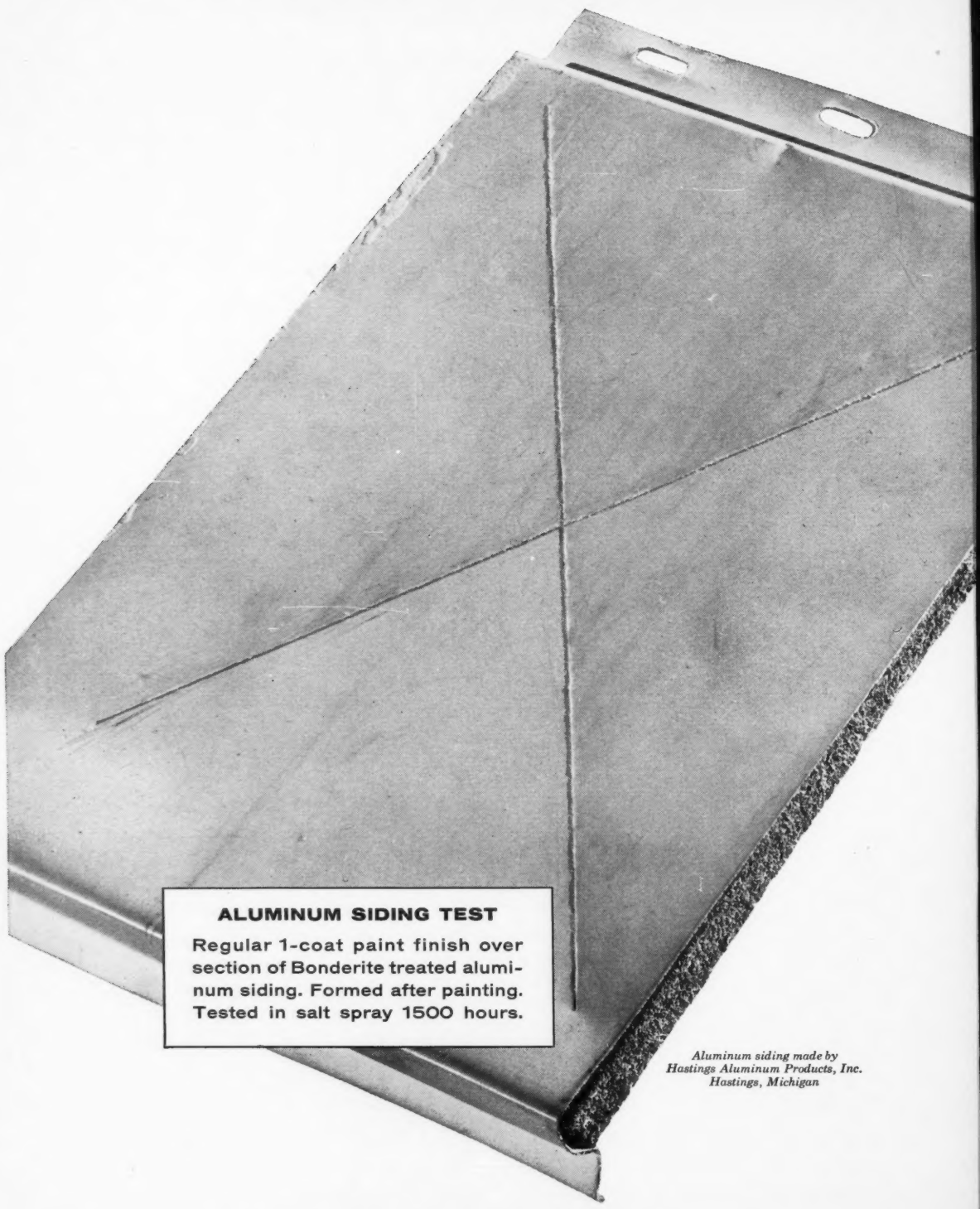
MINIATURE PRECISION

MPB

BEARINGS, INC.

Helps you perform miracles in miniaturization

BONDERITE



ALUMINUM SIDING TEST

Regular 1-coat paint finish over section of Bonderite treated aluminum siding. Formed after painting. Tested in salt spray 1500 hours.

Aluminum siding made by
Hastings Aluminum Products, Inc.
Hastings, Michigan

Circle number 129 on time saver card

for ALUMINUM

Better paint adhesion...better corrosion control

In two hundred plants—many of them the leaders in their particular fields of aluminum fabrication—Bonderite for aluminum is being used today!

Bonderite makes it possible to take aluminum in the coil, run it through a continuous line in which the strip is cleaned, Bonderized, roll-coat painted, dried—and then recoiled.

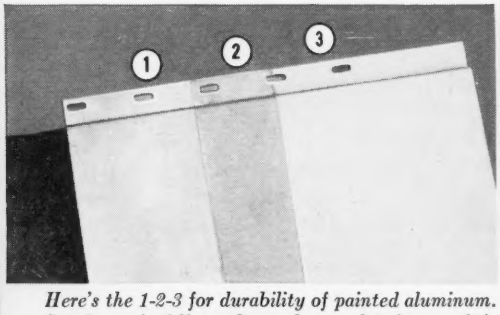
Because Bonderite gives paint such a secure foothold, it will stand severe forming operations (see photo below). With the Bonderite corrosion barrier at work, durability of the paint finish is almost indefinitely prolonged.

Bonderite meets and exceeds the requirements of Government Specification MIL-C-5541. Bare corrosion resistance is outstanding.

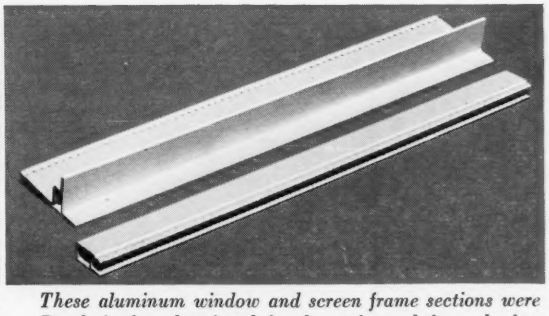
There's more than one type of Bonderite for aluminum. Besides the paint base, there's a Bonderite that creates a pleasant green coating, for use on architectural products. There's a Bonderite which protects without changing the characteristic color of the aluminum. Another Bonderite coats aluminum, steel and zinc—just the thing for mixed production.

There is a Bonderite, in fact, for every form of aluminum production, and for practically every alloy.

The big news in surface treatment for aluminum today is Bonderite! Let a Parker man tell you all about it!



Here's the 1-2-3 for durability of painted aluminum. Section of siding shows bare aluminum, (1); Bonderite treated, (2); and roll-coated paint, (3).



These aluminum window and screen frame sections were Bonderized and painted in the strip and formed after painting. There isn't a break in the finish anywhere!

Since 1914—leader in the field

PARKER RUST PROOF COMPANY
OF CANADA, LTD.
Rexdale Blvd., Rexdale (Toronto) Ontario

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

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*Could be 50,000, 100,000, 200,000, or whatever your production run.

You save time and money every time a Speed Nut is tightened. Multiply this saving by the number of fastening operations on your assembly line and the cost reduction is very significant. What's more, improvement in product performance accompanies this cost savings because Speed Nuts provide a *positive* spring tension lock to every fastening.

There are 8,000 different types and sizes of Speed Nuts now in use. If one of these won't cut *your* costs, we'll design one that will.

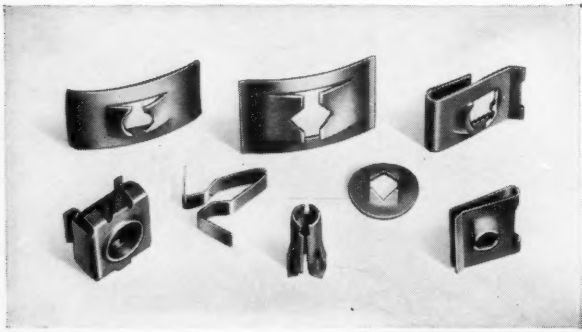
WITH

DOMINION FASTENERS

Speed Nuts®

Exclusive TINNERMAN Canadian Licencee

Take 10 seconds now to fill in this coupon — and you'll save precious seconds thousands of times over to lower your production costs.



DOMINION FASTENERS LIMITED

a Geo. A. Tinnerman *corporation*

HAMILTON, ONTARIO, Sales Branches: Toronto, Montreal

Like most manufacturers, I want to get my production costs down. Please rush complete information on how Speed Nuts can help me.

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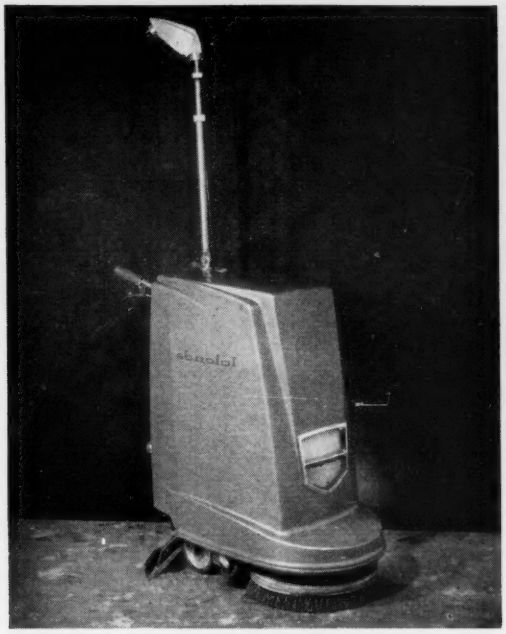
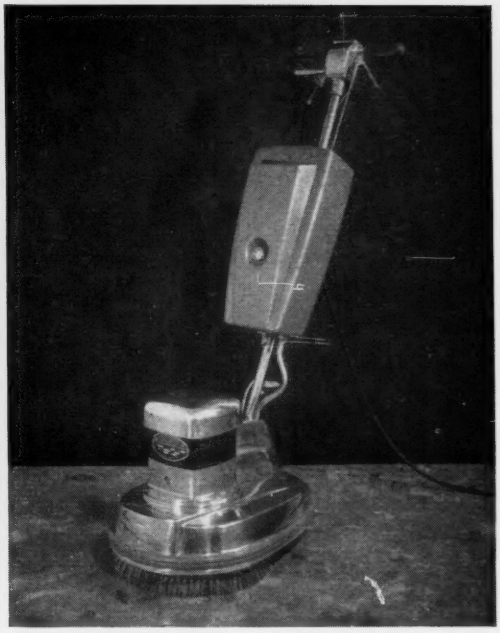
VIBRIN

molds better products more economically!





Cleaner Designs With VIBRIN

Both these versatile new cleaners were designed for Frank C. Lalonde Limited of Montreal by Fortune Associated. And both housings were molded of VIBRIN at a fraction of 'normal' cost of competitive metals — by CUSTOMOLD LTD., also of Montreal. And that's the story line of a hundred stories about VIBRIN polyester reinforced with glass fibre. In one application after another, molded VIBRIN is improving on wood and metal — with important savings in the bargain.

VIBRIN requires neither heat nor pressure, and only the most inexpensive molds. Yet it offers great strength, light weight, corrosion resistance and the colour of your choice.

Naugatuck technical representatives are at your service, and the facilities of our development laboratories are available to help you evaluate Vibrin — to improve present products or to create new ones. Simply contact Naugatuck Chemicals at Elmira, Ont., or our branches in Montreal, Toronto, Winnipeg or Vancouver.

Other NAUGATUCK Plastics

Vibramix — Polyester Premixes
Kralastic — Styrene Copolymers
Marvinol — Vinyl Resins

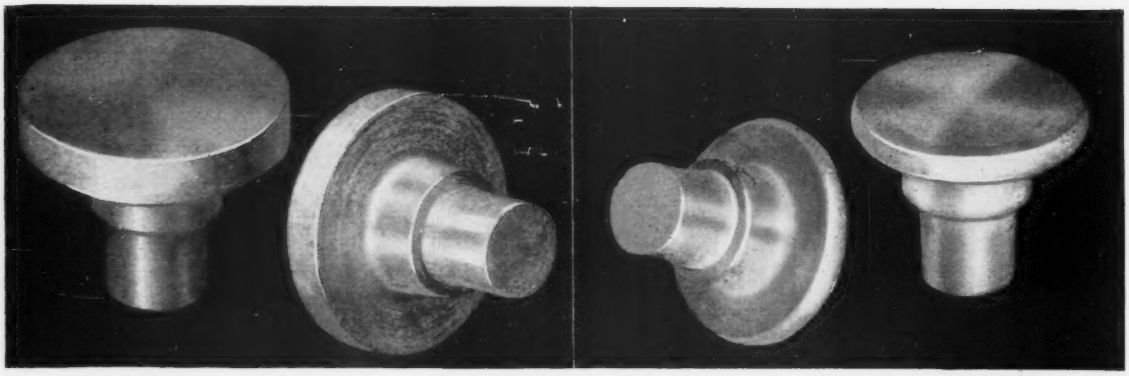
Naugatuck Chemicals
DIVISION OF DOMINION RUBBER COMPANY LIMITED

Circle number 126 on time saver card

TO SAVE ON **FASTENERS**

Standardize your Specials

THROUGH STELCO **COLD HEADING**



Machined "Special" . . . slightly redesigned as a Cold Headed "Standard"

The simple Flat Head Shoulder Rivet shown on the left above (enlarged), was slightly amended as seen on the right, to permit production by cold heading instead of by machining. The elimination of scrap loss, combined with increased speed of production, brought a saving of 80% to the purchaser.

Pictured below are several other "specials" standardized by Stelco with considerable cost reduction.

57121.B

Result - 80% Savings!

Stelco's modern bolt-making facilities, plus the services of Specialty Fastener Representatives, offer you three ways to save on "special" fasteners —

FIRST — Many types of contoured parts can be produced by cold heading more economically than by machining. Not all savings are as impressive as the one illustrated above, but *cost reductions in the region of 40% are not uncommon* and are often accompanied by minor redesigning which adds to the strength of the part. Secondary operations, such as thread rolling or cutting, knurling, extruding, flattening, piercing, drilling, broaching, and bending are also provided for in Stelco's facilities.

SECOND — Stelco will carry as stock items your long-run repetitive "specials" — giving you a ready source of supply and the benefit of large-quantity prices.

THIRD — Your "special" requirement might already be in stock as a Stelco "Standard" — or possibly an existing "special" could meet your needs. In either case you would realise a saving.

Why not ask Stelco's Engineers to examine *your* "specials"? If they are adaptable to production by the cold heading process your cost reductions will be substantial. Any Stelco Sales Office is at your service.

THE STEEL COMPANY OF CANADA, LIMITED

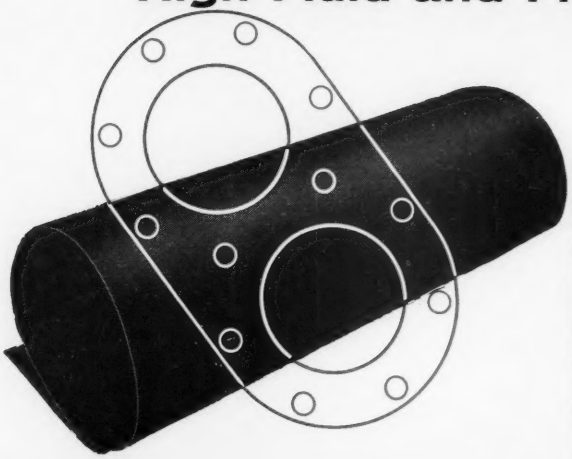
Executive Offices: Hamilton and Montreal

Sales Offices: Halifax, Saint John, Montreal, Ottawa, Toronto, Hamilton, London, Windsor, Winnipeg, Edmonton, Vancouver. J. C. Pratt & Co. Limited, St. John's, Newfoundland.

Circle number 142 on time saver card

VICTOPAC

Asbestos-Synthetic Rubber Gasketing Durable under Heat, High Fluid and Flange Pressures



Seals against oil, engine fuels (liquid or vapor) and coolants, steam, hot or cold water

Supplied in Sheets . . . or Finished Gaskets
Made in standard thickness:
1/64″—1/32″—1/16″—3/32″—1/8″

This tough, completely homogeneous sheet packing is composed of long-fiber asbestos and synthetic rubber, bonded under heat and pressure.

While thoroughly dense in structure, Victopac has sufficient compressibility for effective sealing under light or heavy flange loading. Its resistance to heat permits usage where plant fiber packings deteriorate.

CONDENSED SPECIFICATIONS

Type	SAE-ASTM Spec.	% Compression 5000 Psi. Load	Recovery %	Minimum Original Tensile	Max. Thickness Change in ASTM Oil No. 1—5 hrs. at 300 deg. F.
1	G-1111-1 *P1161A	12±5	40	1800 psi.	20%
1B	G-1111-1 (Federal Spec. HH-P-46A *P1161A	12±5	40	1800 psi.	20%
2 Graphite coated, one side	G-1111-1 *P1161A	12±5	40	1800 psi.	20%
3 Graphite coated, two sides	G-1111-1 *P1161A	12±5	40	1800 psi.	20%
50V	G-1122-1 (AMS 3232F) (Navy Spec. 33-P-13c) *P1141A	12±5	40	2000 psi.	10%
60V	G-1123-1 (AMS 3230 and 3231) *P1151A	12±5	40	2000 psi.	15%
70V	G-1122-1 (AMS 3232F) *P1141A	12±5	40	2000 psi.	10%

*Latest ASTM No. D1170-58T, SAE No. 90R and MIL-G-12803A specifications.

Made in 7 types — Typical uses

Victopac is widely specified for automotive and industrial machinery applications. Choice of seven basic types provides economical sealing for each use. All types conform to SAE-ASTM specifications and are certified to federal, military or customer specifications where needed.

Typical applications include speed reducers, transmissions, differentials, gear case covers, pipe flanges, refrigeration, pumps, oil coolers, internal combustion engines, etc. Victopac's uses are almost unlimited.

Test samples supplied free

Your inquiry, stating proposed application, will bring you sample sheets of recommended type with full technical data. Request through your Victor Sales Engineer or directly to factory.

Victopac is available in sheet sizes 58″ x 62½″ and 58″ x 125″. Write for special price list.

Victor Mfg. & Gasket Co. of Canada Ltd., St. Thomas, Ont. In the U. S.: Victor Mfg. & Gasket Co., Chicago 90, Ill.

VICTOR

Sealing Products *Exclusively*

1909 — 1959 50th ANNIVERSARY GASKETS-OIL SEALS

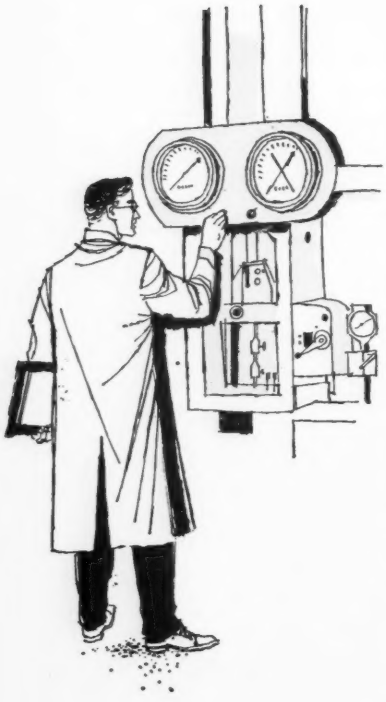
GASKETS • PACKINGS • OIL SEALS • MECHANICAL SEALS

Circle number 154 on time saver card

When the demand is for

QUALITY...

SHAWINIGAN STAINLESS STEEL



Why does industry demand 'Shawinigan' Stainless Steel when it wants castings of the highest quality?

Because experience has convinced our customers that Shawinigan's *full laboratory control* of every processing stage produces the finest corrosion and heat resisting castings in Canada.

Every casting produced by Shawinigan is closely checked and inspected at every stage of the process. X-ray tests, Gamma radiography, fluoroscopic examination of non-magnetic materials and magnaflux inspection of ferritic and martensitic type stainless steel . . . these are only some of the checks employed by Shawinigan.

Discover how you can be sure of top quality and save money by using 'Shawinigan' Stainless Steel corrosion and heat resisting castings.

SHAWINIGAN CHEMICALS LIMITED

Stainless Steel and Alloys Division

SHAWINIGAN TRADE MARK REGISTERED

Head Office: **Shawinigan Bldg., Montreal, Que.** • ***Branch:*** **505 Eglinton Ave. W., Toronto, Ont.**

Circle number 138 on time saver card

Five all-aluminum refrigerator cars have been delivered to the Canadian National Railways by National Steel Car. These, the first all-aluminum refrigerator cars ever built as rolling stock, represent a substantial advance in the wider use of this metal. The design details were worked out with the Aluminum Company of Canada.

Staff written feature

First all-aluminum refrigerator cars

That an entire rail car can be designed and fabricated in aluminum, demonstrates just how far the techniques of aluminum design have developed, as well as opening up a vista of new structural uses.

A significant point in the design of this aluminum structure (and one which demonstrates strikingly the possibilities of the metal) is the composite welded and riveted underframe. The design was based on experience gained from extensive impact testing on an aluminum underframe designed for some hopper cars built in Canada for use in Jamaica.

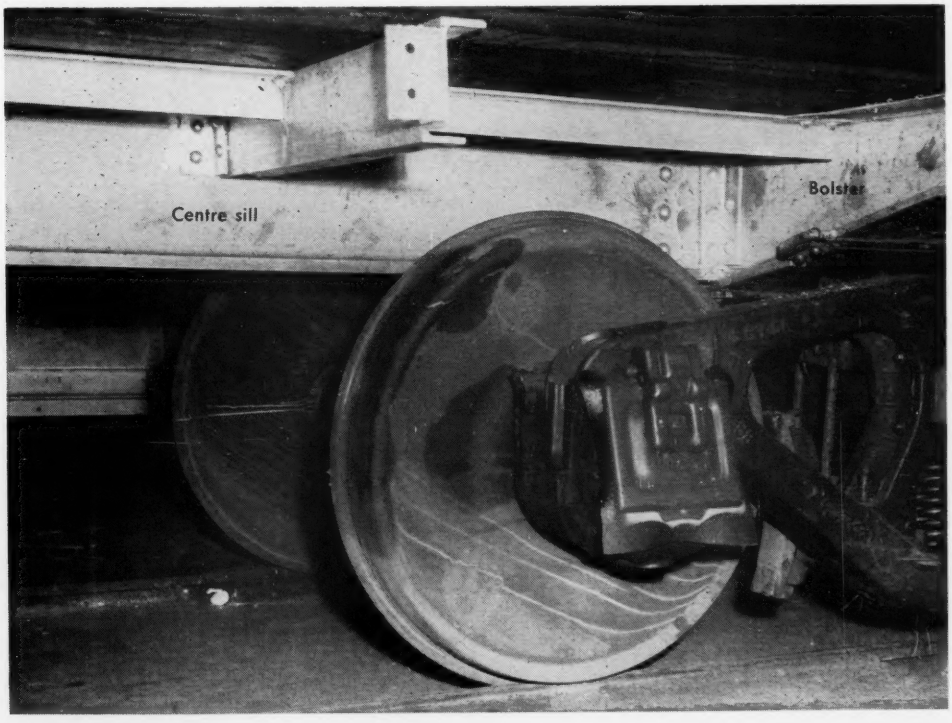
That car was subjected to 75 impacts, 50 of which were at collision speeds involving loads up to a million pounds.

The underframe is built around an aluminum centre sill, consisting of a conventional weldment of two Z-type extrusions, forming a large top-hat section (see diagram). The depth of each zee is approximately 13 in., which makes the section the largest extrusion produced in Canada. Each extrusion weighs 17.5 lb./ft., approximately half that of an equivalent steel section. Welding of the aluminum centre sill was carried out on a jig, with an automatic welding head traveling on a trolley on top of the section. The five sills for the refrigerator cars were produced along with 17 other centre sills required for covered hopper cars.

The alloy for the sill (and for the other extruded sections used on the car) is Alcan 65S-T6, a heat-treated section with a typical yield strength of 40,000 psi. Since extensive welding of this material reduces the mechanical properties, special care was taken to avoid transverse welds (welds, that is, applied across the full section). Longitudinal welds (such as the joint between the two zees forming the centre sill) do not materially affect the strength of the section, because they are in line with the applied forces.

The main transverse structural members are the bolsters that carry the loads from the sides of the

Aluminum bolster, part riveted-part welded design is shown attached to centre sill with steel rivets.



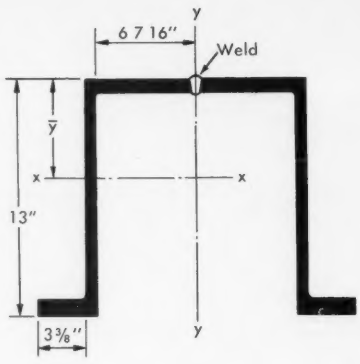
continued

car. The sides are considered as the main load-carrying beams and the bolster transfers the load to the trucks. The bolsters are a separate sub-assembly, fabricated from Alcan B54S-H21 and H-11 material. The diaphragm is connected to the top and bottom cover plates by welding, but attachments from the bolster to the centre sill and side sill are by steel rivets, thereby eliminating transverse welds on the longitudinal members. Similar procedures were used with the cross-bearers and cross-ties, which transfer the floor loads to the side frames. The use of steel rivets is acceptable in spite of the severe corrosive service, because of the large ratio of aluminum to steel. The aluminum is anodic to the steel and this tends to protect the steel rivet without prejudicing the strength of the aluminum sections.

The corrosion behaviour of the underframe is an important consideration in the design and where possible any crevice (that might collect accumulations of brine and dirt) was eliminated. Brackets that formerly produced such crevices were reversed. All joints were thoroughly caulked (both during fabrication and after assembly) and the completed underframe was given a complete paint-coat system of wash primer, zinc-chromate primer and two coats of aluminum paint. This was particularly desirable because of the number of steel fixtures attached to the aluminum underframe. These were necessitated by certain AAR restrictions on the use of aluminum for safety equipment. In other cases (such as the steel underslung-heater) the possibility of fire precluded the use of aluminum.

As explained earlier, the centre sill was tested on a covered hopper car, prior to the design of this car. One reason for testing was to determine the stresses in an aluminum underframe, in order to assist the design of the refrigerator car. An important finding of the test was that the diagonal end-braces take a large proportion of the end loads during buffing. As a result, oversize diagonal braces are used to relieve the stress in the bolsters and to avoid failure at the bolster-centre sill connection, an important area of the design.

Bolster and diagonal brace: the rivets are steel painted.



$A = 29.7728$ in.^{2} $Iy = 1368.32$ in.^{4}
$Ix = 734.17$ in.^{4} $\bar{y} = 6.5061$ in.
Weight = 34.9328 lb/ft

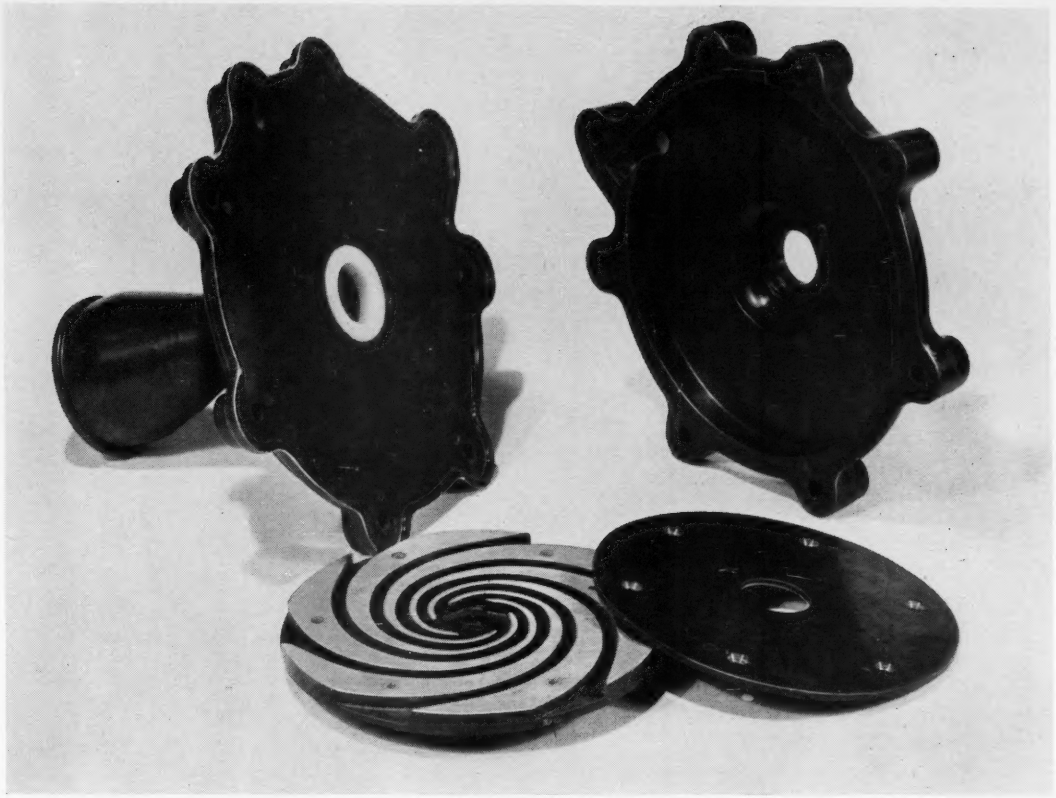
FIGURE 7: Design brief for two-piece top-hat extruded aluminum centre sill.

The result of these and other design features will be indicated by a second series of impact tests on one of these five refrigerator cars with a welded, all-aluminum open hopper car acting as an impact car. The refrigerator car will be the test car, equipped with strain gauges attached to two oscillographs to indicate strains on impact. For practical reasons, the CNR have set a limit of 750,000 lb as the maximum impact level applied to the draft gear.

Such standard items as draft gear, centre filler, rear draft lugs, draft gear key and so on remain in steel and are attached, where necessary, to the underframe with hot steel rivets. Protection between the aluminum and steel is insured by a priming coat on the steel, a zinc-chromate priming coat on the aluminum and a car cement (or Alumilastic) at the interface. This type of protection has proved completely successful in over twelve years' experience.

One point of interest is the follower plate, which transmits the tractive effort from the coupler to the centre sill. In operation, this item moves backwards and forwards in the centre sill, and it was found that steel follower plates tended to gouge the sides of an aluminum centre sill. For this reason, it became standard practice to install aluminum follower plates. These have been entirely successful. They are made from a forging in Alcan 26S-T6 of similar dimensions to the steel item, which can be called upon to transmit some 300,000 lb of tractive effort from the locomotive to a train of cars. ★

This article has been specially prepared by **DE** *from information supplied by Canadian National Railways and the Aluminum Company of Canada Ltd.*



Just five major parts. Two-piece impeller assembly in foreground; housing and volute behind; intake tube, left.

An all-plastic centrifugal spray pump

High chemical resistance, low mold cost both influenced the choice

Excellent resistance to all types of chemical spray, improved performance, fewer servicing problems and simplified assembly procedures are major features of an all-plastic, centrifugal spray pump developed by the Food Machinery & Chemical Corporation.

As the first centrifugal pump developed for garden sprayers, it has several advantages over the positive-displacement piston type conventionally used in this equipment. At any given engine speed, the delivery pressure is constant, which results (it is claimed) in a steady spray, instead of the pulsating stream characteristic of piston-type pumps. This, in turn, permits better control of the spray and reduces waste.

The pump is extremely simple in operation. It contains just one moving part (the impeller) coupled directly to the output shaft of the engine. The absence of the usual belt drives, pulleys and related bearings (as well as pistons and valves) simplifies maintenance and greatly reduces the amount of adjustment and servicing required in the field. From the manufacturing standpoint, the simplified construction permits the pump to be assembled in less than half the time required for a comparable piston type.

All the major parts of the pump (the 6½-in. diameter, 6-vane impeller; the two-piece housing of impeller base and volute; and the intake tube) are molded from Thermaflow 100, a glass-reinforced low-pressure polyester molding compound manufactured by Atlas Powder Company. All structural details (flanges, rims, bosses and bolt holes) are molded in. The only machine operations are: tapping the holes for the outlet and agitator by-pass connections, and for the six screws that fasten the cover disc to the impeller.

Molded polyester and die-cast aluminum were the two possible choices for the pump material, but the plastic was selected to take advantage of the lower mold costs and better chemical resistance of the polyester molding compound. For the parts in question, the use of a low-pressure molding compound permitted the use of molds that cost 60% less than the dies required for aluminum die-castings. In addition to substantially lower mold costs, the Thermaflow molding compound has the advantage of broad chemical resistance, excellent mechanical strength and surface properties, and good dimensional stability. The material has outstanding resistance to a variety of chemicals, such as concentrated acids, alkalies, sulfates, chlorides, oxidizing agents and some organic solvents. ★

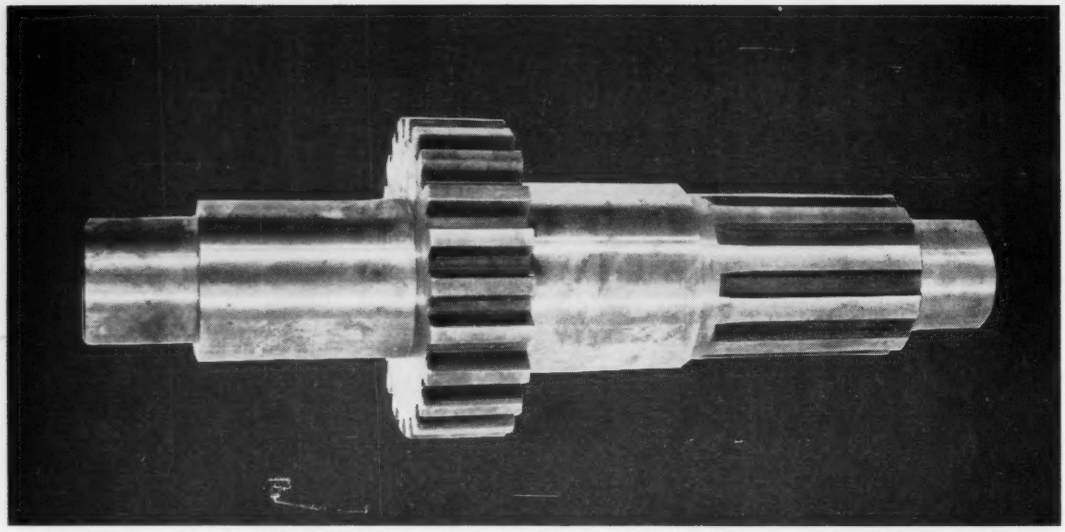


Fig. 1. Pinion shaft made of AISI 4620 (Impacto). Such parts are machinable when slow cooled after carburizing

New steels alloyed for specific jobs

Staff written feature

Many users of steel do not have sufficient demand for the standardized SAE and AISI types. Atlas Steel Ltd. have therefore developed a group of eight steels (commonly known as machinery steels) which practically cover the full range of constructional applications.

These steels (products of the basic electric furnace) are made under close chemical and physical control (including grain size) to obtain uniformity from bar to bar. Each one is alloyed for optimum service in its own particular field. The steels are available as bars, billets, coils, rings, discs, forgings, cold drawn products (up to about 2½ in.) or centreless ground (up to 5 in.). Large stocks of standard bar sizes are always maintained.

Examples of three of these steels are given.

Fig 2. These ring cages are made of Suprimpacto (4820).

AISI 4340 (Ultimo—4), with 1.65 to 2% nickel, has been designed for those applications requiring high strength in large sizes.

For example, sections up to 2 in. diameter are rated at 175,000 psi minimum. In a similar way, sections up to 4 in. diameter are rated at 150,000 to 175,000 psi, and so on.

These values are obtained after heat-treatment.

AISI 4820 (Suprimpacto), with 3.25 to 3.75% nickel, supplements Impacto for special carburized jobs requiring extra high core strength, without sacrificing toughness and wear resistance. It is unexcelled for carburized parts under severe operating conditions. It must be annealed from 1240 to 1298 F after carburizing, if additional machining operations are required.

For maximum case-hardness and optimum core properties, the parts must be cooled to room temperature after carburizing, before re-heating for hardening.

Examples are given in Figs 2, 4 and 6.

AISI 4620 (Impacto), with 1.65 to 2% nickel, is used principally for the general run of carburized jobs requiring an alloy steel. Parts are machinable when slow cooled after carburizing, and do not require annealing.

For maximum case-hardness and optimum core properties, the parts must be cooled to room temperature after carburizing, before re-heating for hardening.

Because of its analysis the material can be used in the quenched and drawn (not carburized) condition, for small machinery parts that can be water-quenched and require fair strength with exceptional toughness (such as studs, bolts, pins and set screws). It also finds use in the normalized condition for applications requiring low notch sensitivity and high toughness, if a tensile strength of 85,000 psi is adequate. (See Figs 1 and 3.)

Fig 3. With Fig 1. this gear is part of a tandem roller

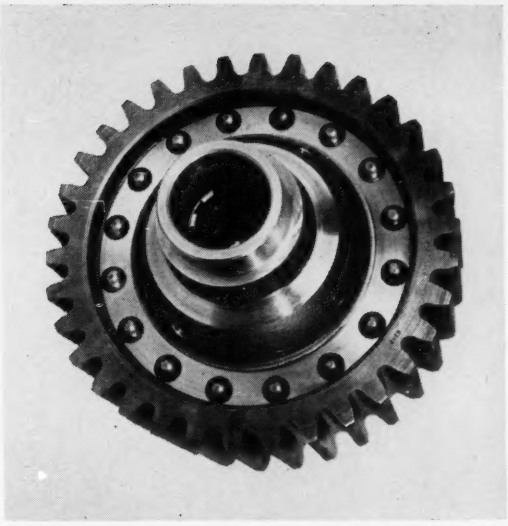


Fig. 4 Differential assembly of 4820 (with 3.50% nickel).

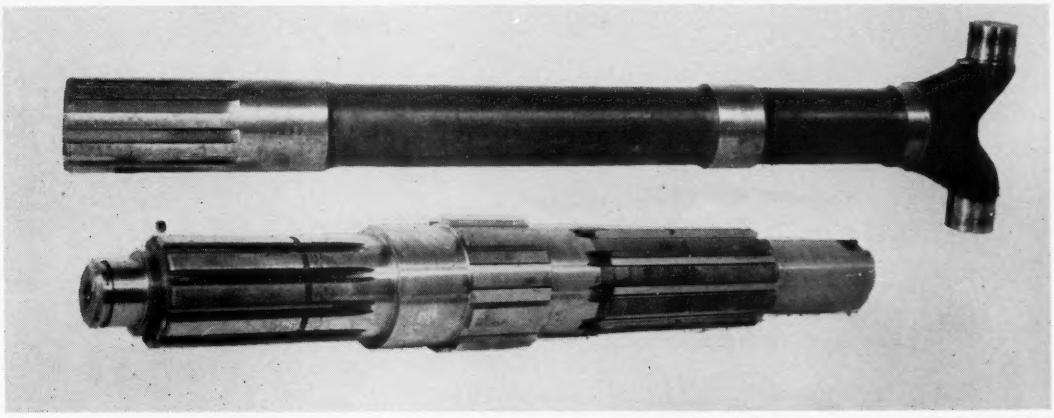
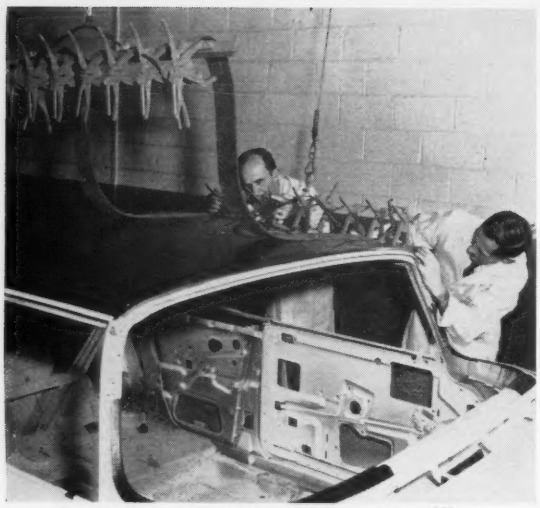


Fig. 5. Shaft at top of this illustration is made of Ultimo-4: transmission shaft below of Impacto (with 2% nickel)

Fig 6. Suprimpacto pinion has extra high core strength.

Fig 7. Further use of AISI 4820 in a ring cage assembly.



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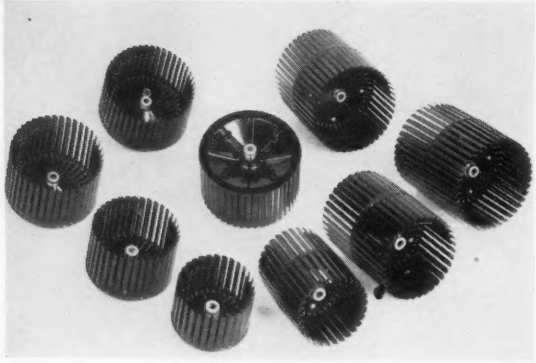

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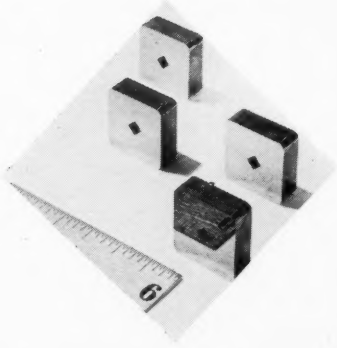

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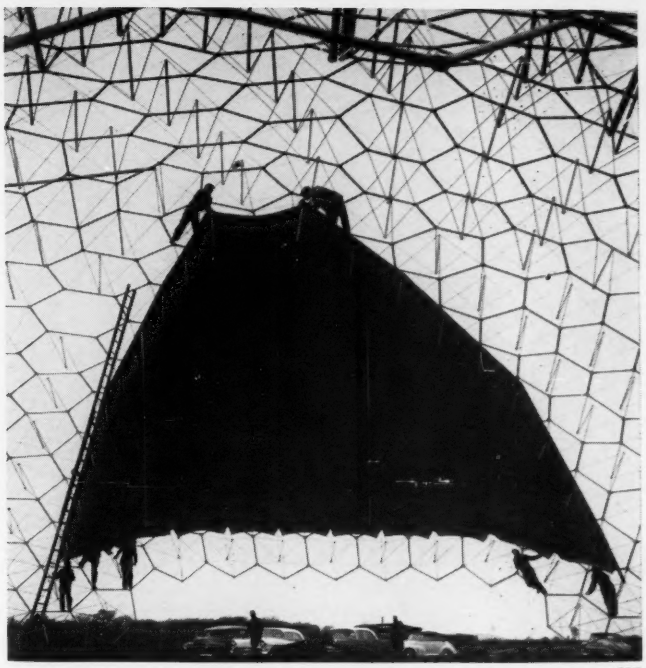
Design news in pictures

206



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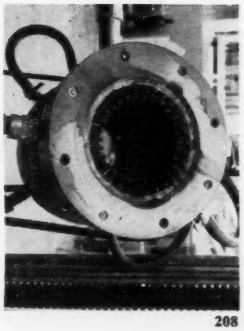
200—The two men are busy with drill and draw fixtures, putting a stainless steel top to one of 1959's luxury autos. 201—Patterns in these translucent plastic panels are embedded in the reinforced resin during manufacture. 202—Internal telephone may be used for simple two-way system or up to six units. 203—Molded plastic blower wheels are aero-dynamically designed. 204—Making sure: component for an industrial bucket undergoes strength tests to check design calculations. 205—The finish on these indexable inserts is mirror-like and is said to reduce chip friction and cratering. 206—This new cellular insulation material looks easy enough to apply — and makers say it's low-priced too. 207—Up goes the framework of the geodesic dome — central feature of the Canadian Trade Fairs in the West Indies. 208—Mind your fingers there — this quick-heat furnace will reach 3,500 deg. F in 90 seconds! 209—No special talent is required to operate this moisture balance apparently. It uses infra-red lamp. 210—Combination hammer, centre punch, magnifier and scriber has a host of applications from engineer to model maker.



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You can turn heat on metal-ceramics

Designers of high-temperature components are exploiting the properties and potentials of a relatively new group of hybrid refractory materials. These are the Haynes Alloys metal-ceramics LT-1, LT-1B and LT-2.

Parts made of metal-ceramics are currently in service at temperatures above 2,300 F. They are functioning well while exposed to thermal shock, abrasion, erosion, oxidation, metal-wetting and severe corrosion. Typical uses are for mechanical seals, thermocouple protection tubes, flow control pins and other parts.

LT-1 is composed of 77% chromium and 23% alumina by weight. This combination provides properties that neither metals nor ceramics alone have.

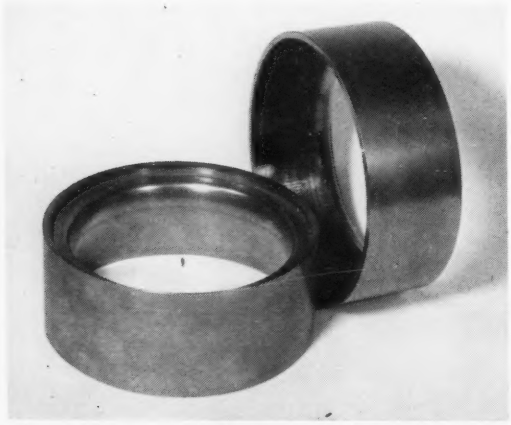
LT-1B is made of chromium, alumina, molybdenum and a small percentage of titanium oxide. It is stronger, has better stress-rupture properties, but is slightly less resistant to oxidation, than LT-1.

Tungsten, the major ingredient of LT-2, gives it an even higher strength and also improves its resistance to erosion and abrasion. LT-2 has a lower oxidation resistance than either LT-1 or LT-1B.

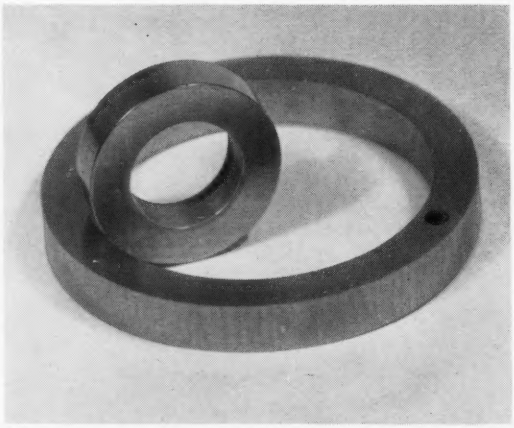
Parts are made of these three metal ceramics by slip casting to a large variety of sizes and shapes. The casting process permits considerable flexibility in design, by allowing for undercuts and intricate internal and external contours.

These metal-ceramics do have certain limitations, however, for although stronger than ceramics, they are relatively brittle as compared with metals, and are not recommended for use under high stress or mechanical shock conditions. Also, they should not be used in carburizing atmospheres, which tend to embrittle them and create dimensional distortion.

(Information supplied by Union Carbide Canada Ltd.)



These rocket nozzle inserts are made of LT-1B and LT-2



Top of page — flame holder: above mechanical seals.

Blind Rivets and Bolts

by **editor William Morse**

Blind fasteners were originally developed for use in the aircraft industry to solve installation problems where only one side of the work was accessible, as in riveting a plate to a tube. It is becoming increasingly evident that they are in many cases cheaper to install than a standard rivet or bolt and nut — and just as strong. For this reason, they are finding more and more applications in light industry in general.

The smallest blind fastener in normal use is of 3/32 in. diameter in aluminum alloy (with a single shear strength of 110 lb) ranging to ⅜ in. diameter steel (with a strength of over 10,000 lb). Some, even in the stronger sizes and materials, can be completely set with an ordinary hammer; others need special hand tools, a pneumatic hammer or a gun operating on standard shop air supply. This means that the fasteners can be set at a very high rate.

Types discussed here:—

1 **Cherry**

2 **Chobert**

3 **Deutsch**

4 **Du Pont expansion**

5 **Pop rivets**

6 **Huck**

7 **Star expansion**

8 **Plasti-rivets**

9 **Rivnuts**

10 **Southco drive rivets**

11 **Jo bolt**

12 **Hi-shear**

It should be pointed out that the illustrations on the following pages are not meant to be precise engineering drawings: they are purely diagrammatic, to show the salient features of each rivet type.

The blind side in every case is to the left.

Please turn the page for details

1. Townsend Company

Cherry-Fracturing Hollow (fig 1.1)

The rivet consists of two parts: a hollow member and a stem. This assembly is positioned in the gun and inserted in the hole. The gun is then actuated, pulling the stem so that its cylindrical, upsetting head expands the rivet tail to form a tulip head. In the next stage the pull continues, fractures the stem and the head falls out on the blind side.

This type of rivet is used where a high clinch is desired and shank expansion is not a factor. Since the broken stem falls out on the blind side, the rivet cannot be used when such a feature would be objectionable.

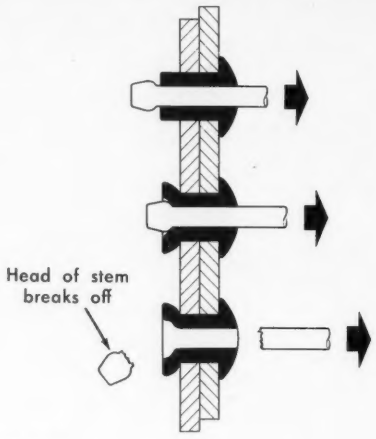


Fig 1.1

Cherry-Pull Through (fig 1.2)

The rivet assembly is positioned in the hole and the gun pulls the conical head of the stem into the rivet, upsetting the rivet tail and forming a tulip head. As the pull continues, the conical head is drawn entirely through the rivet, expanding the shank. The entire stem then falls out through the slot on the operator's side. This rivet does not provide as much clinch as the fracturing hollow type, but it does have about the same clinch as a solid rivet. Because the stem is pulled right through, there is positive expansion of the shank. Sizes are: 3/32 to 9/32 in. diameter.

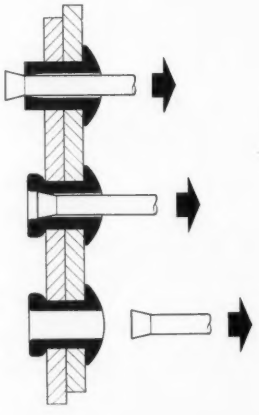


Fig 1.2

Cherry-Self Plugging (fig 1.3)

The rivet is inserted and the pull from the gun draws the enlarged part of the stem into the shank of the rivet, expanding it to fill the hole. Further pull expands all the rivet shank, and the conical tip of the stem upsets the rivet tail to form a head on the blind side. Increased pull from the gun breaks off the stem at the notch and the gun end of the stem falls out. The other end remains in the rivet. The job is finished by cutting off the projecting stem flush with the head of the rivet.

This self-plugging rivet was designed for applications where a hollow rivet is not desired and where a blind fastener is required with similar properties to a solid rivet. The time required for riveting with this type of rivet is longer because of the trimming operation.

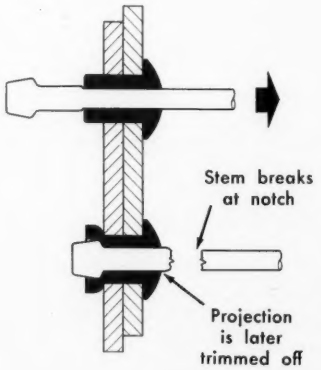


Fig 1.3

Cherry-Drive Pin Rivets (fig 1.4)

Are installed as easily as driving nails. Assembled pins ready for driving are inserted in the hole and struck with a hammer.

One advantage of the hollow or pull-through rivet is that the head can be made to match the surrounding surface by inserting **plugs** (fig 1.5) that completely cover the rivet head. These plugs are available in plastic, copper or aluminum, either natural colored or dyed, as desired.

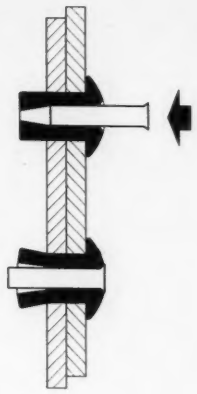


Fig 1.4

Cherry plugs

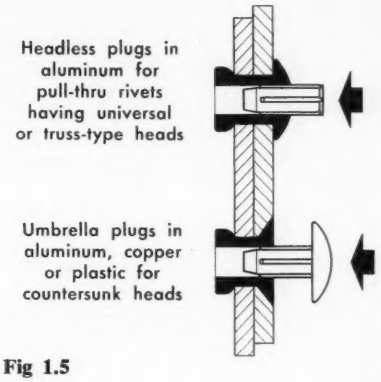

Headless plugs in aluminum for pull-thru rivets having universal or truss-type heads
Umbrella plugs in aluminum, copper or plastic for countersunk heads

Fig 1.5

Although Cherry rivets can be supplied in various heads, alloys and finishes, 100 deg countersunk and universal head rivets (fig 1.6) in anodized aluminum 56 S and A17ST monel and cadmium plated steel are considered standard for fabricating aluminum alloys. The standard shank diameters are 3/32 (Pull Through type only), ⅛, 5/32, 3/16, ¼ and 9/32 in. 7/32 in. rivets are available in some materials.

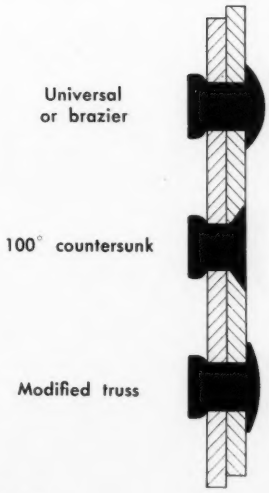


Fig 1.6

continued

2. Aviation Developments (Canada)

Chobert Blind Rivet (fig 2.1)

This rivet originated in France and is one of the oldest types. It is upset by drawing a mandrel through the tapered hole, which leaves essentially a tubular rivet. When water tightness (or additional strength) is required, the hole can be plugged with a taper-end, special interference fit plug.

Because the rivets are supplied in cartridges sufficient for one full loading of the driving equipment, this system lends itself very well to automatic riveting by hand or pneumatic operated equipment.

Sizes: 3/32, ⅛, 5/32, 3/16, ¼, ⅜, 7/16 and 5/16, ½ in.

Material: aluminum and steel.

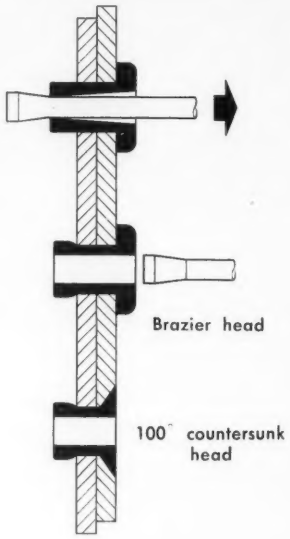


Fig 2.1

3. Deutsch Fastener Corporation

Deutsch Drive Pin blind rivet (fig 3.1)

This type is quickly and easily driven by one man with a light airhammer and a flat set or with just a hand hammer. The correct length is chosen for the material thickness and the rivet placed in the hole. The pin section of the rivet is driven into its seat and this expands the sleeve to form the blind head. The locking lip is peened over to lock the pin in the sleeve. These rivets have a guaranteed shear strength up to 95,000 psi, a tensile strength more than 50% that of an AN bolt, low weight and excellent sealing properties.

The structure being riveted must be heavy enough to support the driving forces. Suggested minimum backing member thicknesses are:

Rivet diameter in.:	⅛	5/32	3/16	¼	5/16	⅜
Thickness in.:	.125	.125	.125	.188	.255	.375

Thinner members can be used if there is sufficient rigidity to support the driving forces.

Head types are 100 deg countersunk and protruding head. The drive pin is of 416 or 431 stainless steel: the sleeve of 303 stainless or 17-4 stainless. Sizes are ⅛ to ½ in. diameter.

Just going into production is a new drive pin blind rivet, (the FS and PS series) with the same basic shear strength as the rivet discussed above, but with the advantage of lower driving loads. This reduces the required backing member thickness.

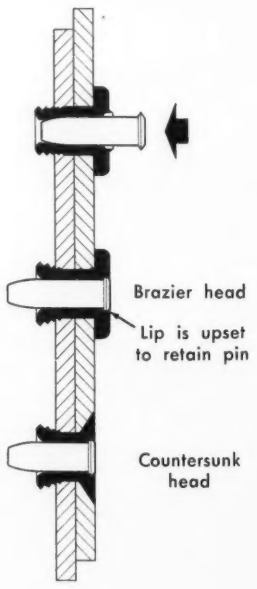


Fig 3.1

4. Du Pont Canada Ltd.

Du Pont Expansion Rivets (fig 4.1)

These are fast-acting, strong, one-piece fasteners similar in appearance to ordinary solid rivets, but with this important exception. Extending the full length of the shank of the rivet is a small, carefully centred cavity which contains a tiny explosive charge. The application of heat to the rivet head (for as little as half a second) fires this charge, causing the shank to expand and setting the rivet firmly and almost instantaneously.

All types have smooth finished heads, so no buffing, trimming or cutting is required. The job is finished as soon as the rivet is set. The shank expands to fill the hole completely, giving a tight joint even with slightly oversize holes. This makes it unnecessary to observe close tolerances in drilling, thus reducing drilling time and further speeding up the fastening job by making insertion easier.

There are two types: the open type (fig 4.1) with the familiar open end and a new development, the sealed type. This was designed for use when the opposite or adjacent structure is very close to the shop end of the rivet. It is practically noiseless when being set.

Industrial expansion rivets are available in nickel-plated brass, 52S aluminum alloy, 56S aluminum alloy and nickel. Standard head styles are: modified brazier and 100 deg countersunk. One of the outstanding advantages of these rivets is that a particular size of rivet may be used for an unusually wide range of material thicknesses. This reduces the inventory needed for most shop requirements and substantially increases production.

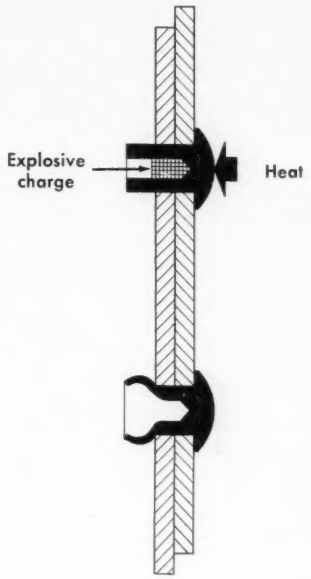


Fig 4.1

5. United Shoe

Pop Rivets (fig 5.1)

There are two types of mandrel: the break stem (fig 5.1) and break head (not shown). The former is used where it is required to retain the broken off portion of the mandrel within the set rivet (as in closed structures where there is no outlet). The break head type is used where the mandrel head is free to fall away from the rivet after it is set.

Used extensively throughout the aircraft industry for many years, pop riveting is now being widely adopted in every industry, for private cars, passenger and commercial vehicles, ships, metal furniture, aluminum doors and windows, domestic duct work. Materials used: aluminum, monel and steel, in diameters from 3/32 to 3/16 in.

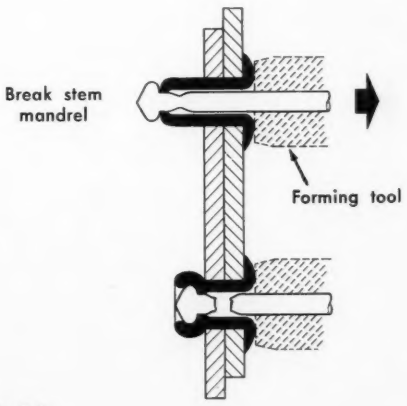


Fig 5.1

continued

6. Huck Manufacturing Company

Huck-Conical Key Stone Lock (CKL) rivet (fig 6.1)

Consists of two precision-made parts, factory assembled ready for riveting. These two parts are: (1) the hollow sleeve (5056-H14 aluminum alloy for aluminum or magnesium assembly) which has a brazier or countersunk head, with a conical recess and a locking collar formed as part of the sleeve connected by a thin web. The other part is (2) the pin, precision made of 2024-T36 aluminum for high shear strength. On the pin are formed an extruding angle and land to extend the sleeve for hole filling, a breakneck groove, a locking groove and a head. Grooves (not shown) on the protruding end of the pin fit the jaws of the rivet tool.

Forming of the rivet is a fast continuous operation. The gun first pulls the extruding angle and land of the pin through the sleeve, positively expanding the sleeve to fill the rivet hole. The sleeve is then squeezed to form a head on the blind side. The driver inside the nose of the gun breaks off the outer collar of the sleeve and forces it into the locking groove. The pin is finally broken off in tension at the breakneck groove.

The positive mechanical lock between the pin and the sleeve of this rivet gives it a load-carrying capacity similar to that of a solid rivet of the same shear strength.

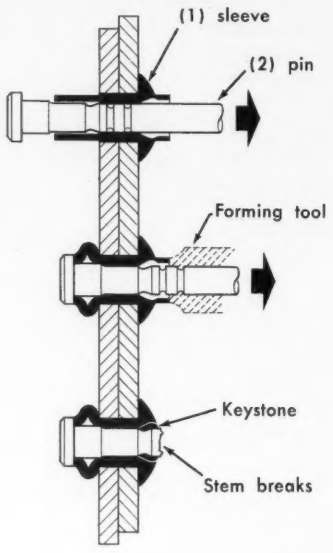


Fig 6.1

Huck-Pull-Through (PT) blind rivet (not illustrated)

This is an excellent low-cost tacking rivet similar in principle to the Cherry Pull Through and Chobert. It is largely used for attaching parts to hollow tubing, or installing in wood or other materials. Excellent hole filling and positive pull-through result.

Materials used are: mild steel pin and 2117-T4 aluminum alloy (or mild steel pin and cadmium-plated steel sleeve).

Huck Self-Plugging (SP) rivet (fig 6.2)

Can be used with a broad range of material thickness and so simplifies stock inventory. The pin shank expands the sleeve to fill the hole and remains in the sleeve to increase the shear strength.

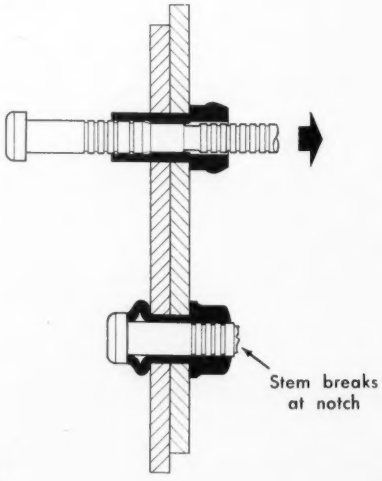


Fig 6.2

Huck Daisy (DR) blind rivets (fig 6.3)

Five powerful sleeve segments pull the sheets together tightly with a broad supporting grip as the rivet is installed pneumatically. The broad bearing area afforded by the spreading sleeve segment on the blind side clamps the sheets tightly against the front washer. All these rivets have a 7/16 in. diameter, washer-type collar.

The rivet is suitable for all types of light sheet-metal application; structures, trucks, heating and ventilating ducts and other fabricated metal products.

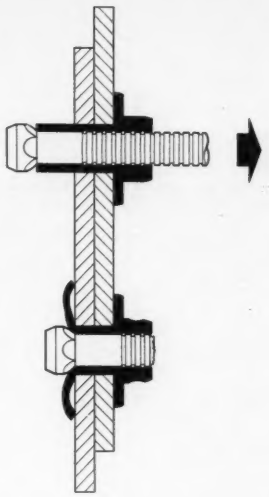


Fig 6.3

Huck Oversize (OS) structural rivet: (fig 6.4)

This is an ideal fastener for aluminum or magnesium assembly where a high strength-to-weight ratio is desired. The rivet is also an excellent blind replacement fastener for repair operations.

A wide bell-type blind head gives exceptional bearing, particularly good for plastic for soft and brittle materials.

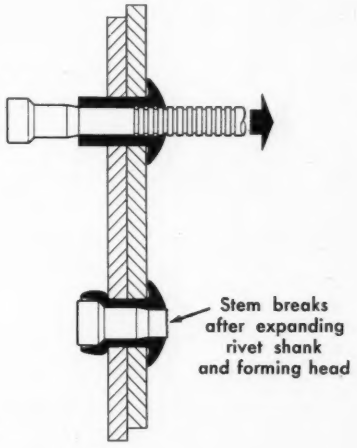


Fig 6.4

Huck-Tau bolt: (not illustrated)

Made in ¼ in. diameter only, brazier or countersunk head.

This bolt gives a positive mechanical lock. A solid collar of steel locks the pin permanently in position. It has high shear strength due to the accurately heat-treated alloy steel pin and the sleeve. There is excellent pulltogether, and high tensile strength is assured by the expanding sleeve design and the positive mechanical lock. The flush pin break eliminates difficult and costly trimming.

continued

7. Star Expansion

Star Expansion (fig 7.1)

The aluminum alloy Pin-Grip body is assembled with a stainless steel, knurled drive-pin. When the pin is driven flush with the head (by a hammer blow), the slotted shank expands and grips firmly. Simultaneously, the knurled pin locks itself in position. The rivet performs well under shear, tension and vibration.

The rivet is used, with wide industrial acceptance, for blind or limited-access applications in the assembly and repair of truck, trailer, bus and auto bodies; porcelain panel construction; the fabrication of tubular metal furniture, duct work, cabinets, displays, fire doors; the mounting of store fronts, nameplates, hinges, ornaments, metal trim. The effective fastening range (in 1/16 in. increments) makes it possible to use a single size for varying work thicknesses.

⅛ in. diameter Pin-Grips have one slot; all others have cross slots.

The rivet body is of aluminum alloy 2117 T4 and the drive pin is of stainless steel or aluminum.

Head styles include the universal, full brazier, splash head round, 100 deg countersunk, splash head flat and panel head.

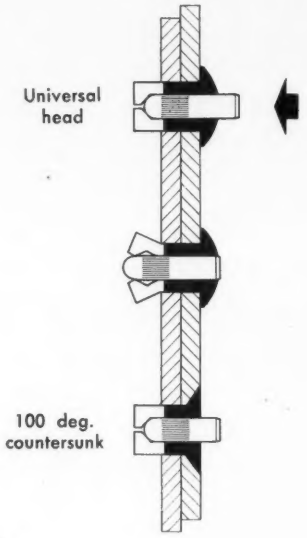


Fig 7.1

8. Shakeproof—Fastex

Fastex Plasti Rivets (fig 8.1)

Are self expanding and easy to install from one side of the work with a positive locking action. The standard rivets can accommodate a range of material thicknesses from .020 to 17/32 in. with a range of diameters from ⅛ to ½ in. In addition, there are many special parts tooled for sizes beyond this standard range.

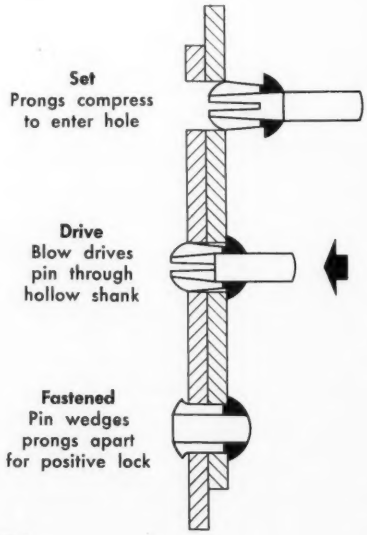


Fig 8.1

9. Goodrich Canada Ltd.

Rivnuts (fig 9.1)

These rivets were originally developed for the attachment of de-icers to aeroplane wings. They are now used, of course, for any manufacturing application. The rivets are made in aluminum, stainless steel, and brass.

Rivnuts are upset with a heading tool (hand or power) that transmits a pull on the threaded portion so that the counterbore (which is thinner) has to give. A bulge starts to form, and the threads push the counterbored portion until the expanding metal seats itself firmly against the material being fastened. The pull-up stud on the heading tool is now removed and the installation is complete. This leaves the Rivnut thread clean and ready for the attachment of other items by means of a screw.

Flat-head rivnuts are used when the head thickness is not likely to interfere with the surface contour or possible attachments to the rivnut. They are often used in flush installations by counter-boring or dimpling the material.

One hundred degree countersunk heads are used for flush installations. Holes can be dimpled or machine countersunk, depending on the material thickness.

Keyed Rivnuts are especially useful on nut-plate applications that are subjected to unusual vibration or torque.

Close-end Rivnuts are used to keep gases, fluid and dirt from sealed compartments, floats, pontoons, oil and gas tanks or refrigerator walls. When sealing is not critical, the open-end type may be used, and sealed by a plug screw or some other method.

Seal-head Rivnuts of high alloy steel, with 100 deg countersunk heads sealed by rubber O-rings, are approved for primary aircraft structures.

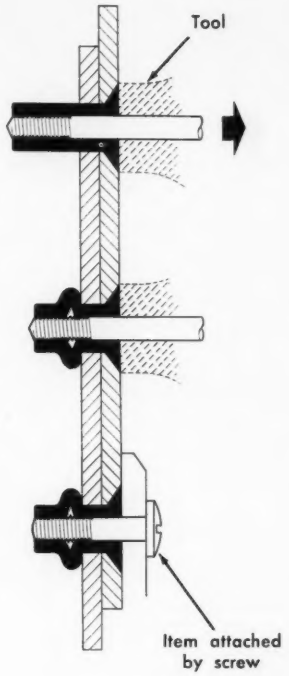


Fig 9.1

10. South Chester Corporation

Southco Drive Rivets (fig 10.1)

This type of rivet consists of a slotted cored rivet with a steel grooved pin, assembled and supplied as a unit. The head is seated firmly against the outer surface and the prongs expanded to pull the sheets tightly together so that no gaps remain. Sizes are ⅛ to ¼ in. diameter.

The three grooves in the steel pin fill with rivet metal displaced by their raised edges. This action locks the pin in place with a minimum of driving force and gives the best hole-filling qualities. As the projections of the pin pass through the rivet head, a cavity is formed. When the pin is fully driven the cavity is filled with metal, further locking the pin in place.

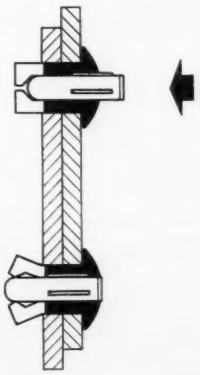


Fig 10.1

continued ▶

11. National Screw

Jo-bolt (fig 11.1)

Is an assembled three-piece fastener consisting of a nut, a screw and a sleeve. It is a high strength, high shear, blind fastener. When installed, the tool prevents the nut from turning. At the same time the tool turns the threaded screw in the nut, thus forcing the sleeve up the tapered nose of the nut, upsetting the sleeve and clamping the assembly together. The assembly is locked very effectively and has high resistance to vibration and fatigue. The stem of the screw breaks off flush, or just below the surface of the head. The Jo-Bolt is available in both protruding head and flush style heads. It is made of alloy steel, aluminum or high temperature A286.

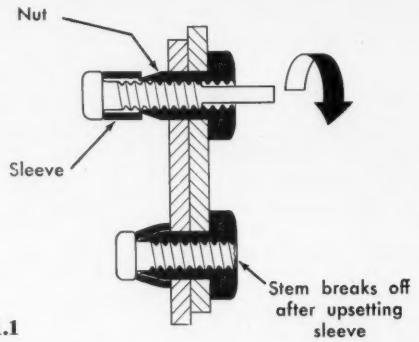


Fig 11.1

12. Hi Shear Rivet Tool Company

The Hi-Shear Blind Bolt (fig 12.1)

The fastener is made of three parts: the sleeve, the core bolt and the expander nut. The sleeve is made of a soft ductile material, such as 302 stainless steel. The core bolt is made of 431 stainless steel heat-treated to a strength level of about 200,000 psi. The expander nut is also of 431 stainless steel, in the same heat-treated condition.

The bolt is installed with a hydraulic gun containing a mandrel, inserted through the sleeve. The expander nut is screwed onto the mandrel. This assembly is then inserted in the hole and hydraulic pressure applied to pull the expander nut into the sleeve until the nut bottoms the sleeve against the work on the blind side. The mandrel is then removed and a core bolt installed in the expander nut to give added strength to the fastener. This fills the hole. The expander nut contains a locking device so that the core bolt will not come loose.

When the expander nut is being pulled through the sleeve the soft material of the sleeve compresses to such an extent that the external diameter of the fastener will swell as much as ten thousandths, if not limited by the diameter of the hole. Thus, the fastener swells to fit the hole to form a snug shear attachment in a hole where tolerances are not closely controlled. Although the hole-filling quality is highly desirable in any fastener, the side pressure exerted by the fastener on the hole is not to be considered as great as that which can be obtained by driving a solid soft rivet in the conventional manner. This is one reason the fastener is considered as a bolt.

Perhaps the most interesting fact regarding this blind bolt is that it is in a high strength classification, which most blind fasteners are not. It can also be used as a nutplate. While the unit price of the blind bolt and nut are slightly higher than most, they are not so expensive when all factors are considered, such as hole preparation, fastener cost, installation and replacement time.

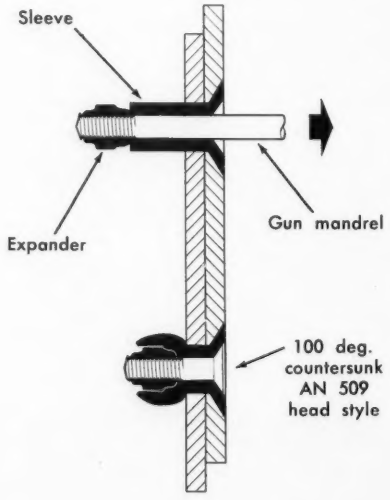
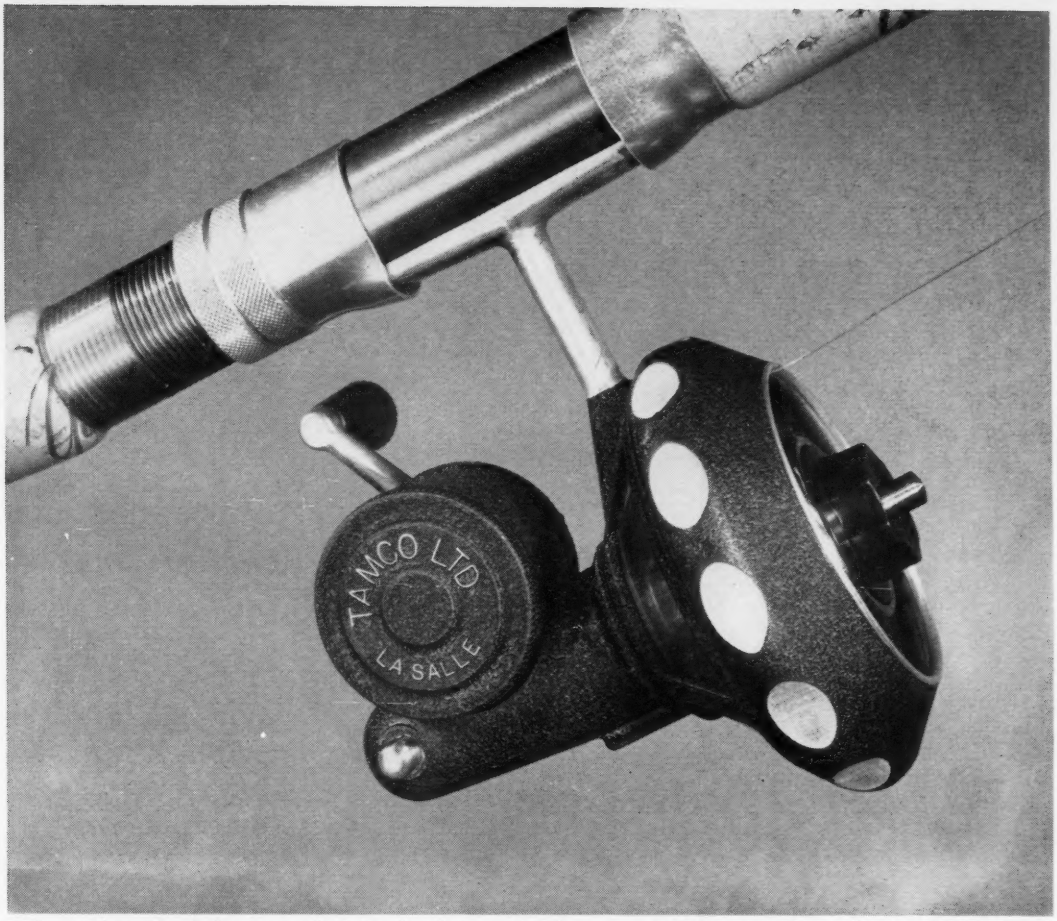


Fig 12.1



Fisherman's angle of the new reel. Note the absence of pickup arm and that controls are comparatively Spartan.

This fishing story begins with the reel

The fisherman had a real grouse — ended up designing his own reel

John W. Dennis

The end product discussed in this article is a new type of fishing reel, designed and made in Canada. The author wishes to extend thanks to Sieg Kuether and his partner, for their assistance in preparing the article.

The item in the fisherman's inventory that comes in for most of the bad language heard around Canada's lakes and streams is the spinning reel, and probably for good reason. If a reel isn't foolproof under all conditions, it can make the difference between a fish in the hand and a mere fish story. Furthermore, it can be the cause of long hours untangling a line wound exasperatingly around rod, reel and fisherman alike.

A man who, by mid-1957, had suffered at the hands of an inefficient reel once too often was Sieg Kuether, and he decided to take steps to develop a reel that ironed out the drawbacks of many of the conventional reels available at that time. In essence, what Kuether wanted to do can be itemized as follows:

(1) Eliminate the accident-prone pickup arm.
(2) Simplify the design to the extent that the reel could be stripped down without the use of any tools (even a screwdriver).

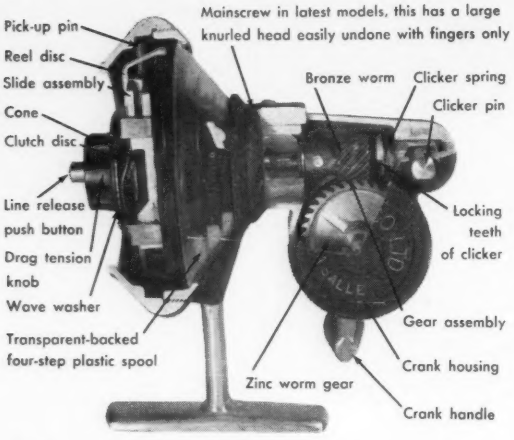


Fig 2

(3) Make the reel free of backlash.
(4) Design a piece of equipment that could be used by either right- or left-handed casters.

With these aims in view, Kuether settled down to some hard work at the drawing board in his LaSalle machine shop. The Tamco Master Reel was the result.

An exterior view of this reel essentially as now marketed is shown loaded and mounted on a rod in Fig 1 (current models have a large knurled mainscrew not shown in Fig 1). The absence of a pickup arm is obvious and the controls have been simplified to include:

(a) Crank handle.
(b) A two-position clicker pin offering an anti-reverse setting.
(c) Drag tension knob.
(d) Release push-button which lets the line run out without interference while casting.

These four controls are indicated in the cutaway reel shown in Fig 2.

The crank handle is held in place in the crank housing (see also Fig 3) by two threaded and knurled caps and can be made to suit a left- or right-handed caster merely by unscrewing and reversing them, thus transferring the handle to the other side of the reel.

Drive from the aluminum crank handle is through a zinc worm-gear and a bronze worm via a stainless-steel shaft to the reel disc, which revolves as it takes up the line. The actual point of take-up is a carbide pin which, when engaged, juts through the reel disc and winds the reel around the disc and into the spool.

One of the most important considerations for any reel is, of course, corrosion resistance, for both the interior and exterior are likely to be wet for most of the time the reel is in use. Choice of material reflects this need right the way through the mechanism. For example, crank handle and housing are of cast aluminum; all pins and screws (only one screw shows on the exterior) are of stainless steel, with the exception of the carbide pickup pin just mentioned.

Zinc and bronze are used for the gears, the reel disc is hard-chromed (as a wear-resistant measure also) and the spool, drag tension knob and crank handle grip are of high-impact plastic. The exterior is finished in a crackle paint.

The reel has a number of interesting, yet simple, mechanical features that come to light in operation.

When casting, the release push-button at the front of the reel (Fig 2) is pressed and the line runs out unhindered. Press the button and an integral internal cone moves the slide assembly to one side, thus withdrawing the pickup pin and giving the line no point to hold onto on the rim of the hard-chromed reel disc.

As soon as the crank handle is turned to wind in, however, the boss on the slide assembly starts to act as a cam follower and follows an internal cam molded into the back of the fixed plastic spool. As this boss reaches the V of the cam, it is pushed in the opposite direction and drives out the pickup pin, so that it engages the line as it uncoils around the spool and reel.

If the crank handle is prevented from turning, either by locking it with the clicker pin (Fig 2) or by holding the handle itself, the line can still be pulled out under a tension which is adjusted by the drag tension knob on the front of the reel. Behind this knob is a simple clutch consisting of a wave washer and a clutch disc in the form of another washer having radial indentations stamped around it.

This clutch is a safeguard against the snapping of the line by a sudden pull. It is also used to tire the fish, which has to fight a steady drag as the line is wound in.

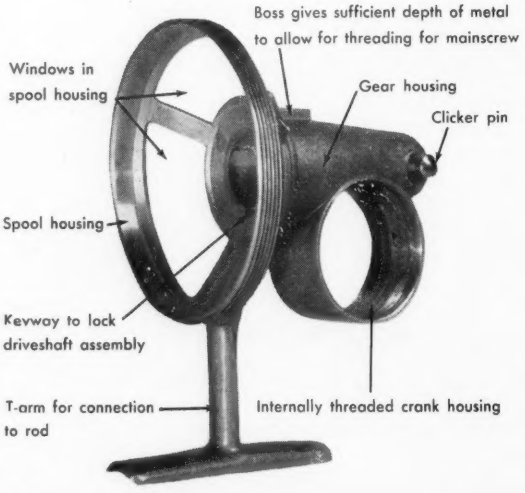

Boss gives sufficient depth of metal to allow for threading for mainscrew
Windows in spool housing
Gear housing
Clicker pin
Spool housing
Keyway to lock driveshaft assembly
T-arm for connection to rod
Internally threaded crank housing

Fig 3

The completely enclosed four-step spool is assembled by a plastic welding process which unites its five sections. One of these sections (cone shaped) is transparent, so that the line can be seen through it and a rough estimate of what remains on the spool. ★

You get these 6 distinguishing characteristics:

Their high mechanical strength and impact and abrasion resistance are important in tooling applications. These properties are also necessary in offering protection to delicate electronic and electric assemblies.

Epoxies resist corrosion and withstand attack from many liquid and gaseous industrial chemicals, oils and greases. Impervious to moisture penetration, epoxies protect sensitive parts, such as coils and armatures.

Epoxies can cure at room temperature, thus broadening the field of application for these reactive resins. Oven size restrictions are eliminated, and capital investments and production costs are cut.

Not only do epoxy tooling compounds ensure close tolerances in reproduction but they also maintain this accuracy throughout the life of the tool.

Insulating resistance and dielectric strength are superior. Working life is extended and efficiency is improved when assemblies are protected by epoxy resins.

Ability of epoxy formulations to bond such materials as ceramics, plastics, and wood enhances the serviceability of these materials in many fields. Property particularly important in coatings where adhesion of finish is equally important as quality of coating.

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Giving more information about "BAKELITE" epoxy resins, and other plastic raw materials.

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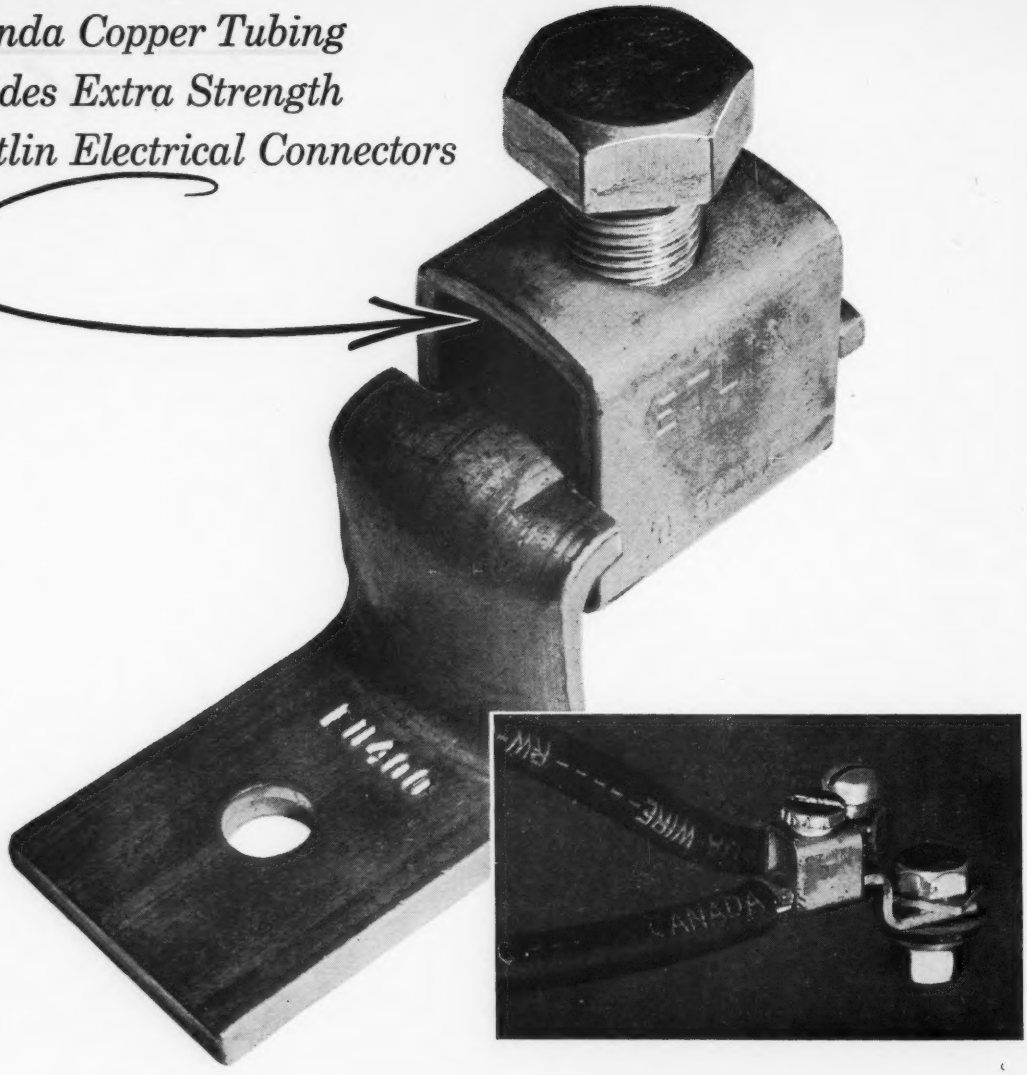
Circle number 103 on time saver card

Specially Shaped Noranda Copper Tubing Provides Extra Strength for Etlin Electrical Connectors



Seamless, pure electrolytic copper tubing is produced by Noranda in a selection of special shapes for electrical solderless connectors. The H. B. Etlin Company, Toronto, one of Canada's major electrical equipment manufacturers, uses the heavy walled five-sided shape illustrated here.

Noranda seamless copper tubing is preferred because of its high mechanical strength as well as electrical conductivity. The tongues are fabricated from heavy Noranda Copper bus-bar for rigid clamping and low heat loss. Ampere range for these connectors is from 25 to 800 inclusive.

Fulfilling special product and component needs is standard practice at Noranda. Noranda technical service stands ready to serve you, your product and production needs—both present and contemplated—on any copper and copper alloy subject, size or shape. A call to your nearest Noranda Sales Office will bring whatever assistance or information you require.

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Briefs

We note with interest . . .

That falling overboard is not so precarious a business these days: a new life preserver will transmit an SOS signal by radio for 72 hours. . . . **Aluminum gets the glamour** treatment in the form of an unusual glittering spangle finish. Predictions are its application in costume jewelry, interior decoration fields. . . . **Typical British reticence** is revealed in this recent announcement "British industry is now ready to welcome enquiries for the design and construction of nuclear power stations . . . research reactors . . . nucleonic equipment . . . of all kinds." . . . **We hear** that Dow Chemical Co.'s high density polyethylene plant in Sarnia will be making first shipment on March 1. . . . **Certainly** an important feature of aluminum aerosols is that they can be produced by extrusion in one piece and at one stroke of the press. . . . **An artificial human skin** may protect high-flying pilots of the future from the effect of radiation from direct sunlight. What about the low-flying sluggards with thick skins? . . . **And what about** the two physiologists in Antarctica who will wear underclothes made from copper wire. Suits were knitted by appropriately named Mrs. Marie Strong, who had to sprinkle her "wool" with talcum powder to keep it workable. . . . **A jet that takes off** vertically and lands horizontally on skids has been patented in the U. K. What makes it different is the pilot can lift and lower the nose to suit landing and take-off. . . . **This is art:** Toronto Art Gallery had problem in knowing how to hang some paintings they got from Paris recently. Some artists said it didn't matter which way their paintings were hung. We wholeheartedly agree. . . . **We understand** that a Canadian company is prepared to design and build equipment for transmission systems capable of operating up to 600,000 volts. . . . **Lazy farmers** can now buy a tractor which has one single control. It handles forward and backward movements and braking. And it doesn't have gearbox, clutch and differential among other things. We do hope it works. . . . **Brass is back** in the news. We learn that "top brass" in business is now surrounding itself with more brass—lamps, desk items, furniture. It has a warm glow, we agree—remembering the warm glow we used to get when we had to clean all the household brassware as a boy. . . . **Mechanical composer** may oust Tin Pan Alley. Feed this dread machine a musical note, toss it a few leaves of theory and up it comes with

(Continued on page 48)

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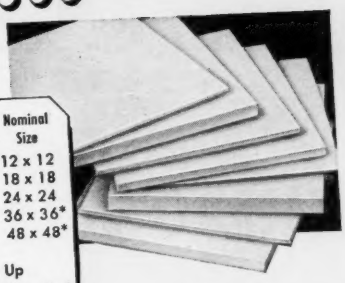
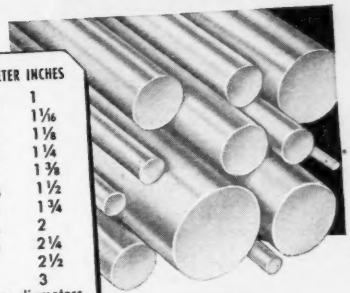


Thickness Inches	Nominal Size
1/16	12 x 12
3/32	18 x 18
1/8	24 x 24
3/16	36 x 36*
1/4	48 x 48*
3/8	
1/2 & Up	

* Can be furnished in ½ sheets

SHEET



DIAMETER INCHES	
1/4	1
5/16	1 1/16
3/8	1 1/8
7/16	1 1/4
1/2	1 3/8
9/16	1 1/2
5/8	1 3/4
3/4	2
7/8	2 1/4
	2 1/2
	3

Other diameters on specification

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O. D.	I. D.
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1/2	3/8
3/4	1/2
1	3/4
1 1/2	1
2 1/2	1 1/2
3	1 3/4

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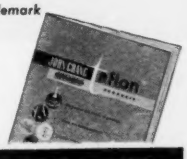

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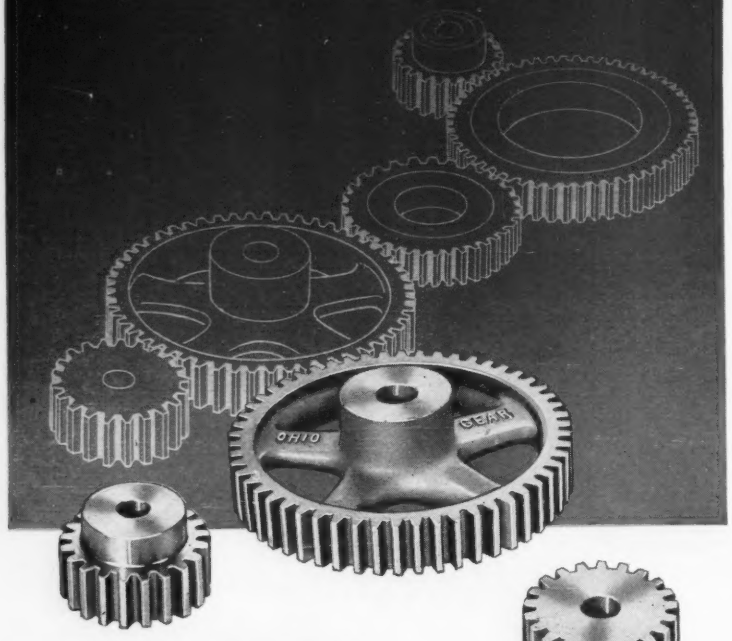

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Briefs *(Continued from page 47)*

music. We doubt it could make a worse noise than some of the contemporary sounds that pass for music. . . . **Metals are in the news** this month: leading makers in high precision industries are using tin-nickel. Examples: watches and drawing instruments. . . . **Helping to reduce** the ranks of one-handed human operators is a mechanical hand on a punch press. It feeds parts into the press many times faster than manual operation—and with more safety for the operator. . . . **Increased prosperity** for Woodside, N.S. when Cossor (Canada) Ltd. merge with Electrical and Musical Industries Ltd. to form E.M.I. Electronics is their business. . . . **Forgive our shudders** — Soviet scientists claim they can make electric wires so thin they are invisible to the naked eye. What price George Orwell? . . . **1959 Nuclear Congress** begins April 5 for a five-day period. Forty sessions will be held and will feature speakers from England, France, Italy. . . . **"Microscatter" communication** equipment is being tested on a 130-mile hop over water between Trenton and Hamilton, Ont. . . . **The second Miniaturization Award** will be presented this March. If you have an entry you should mail it now. . . . **Here's something new**—a heating system that uses electric power during off-peak hours to provide a constant stream of warm air 24 hours a day. . . . **Hooray** for the increased use of stainless steel in automobiles. Glamorous as well as functional it is being used to make mufflers and mascots; dashboards and door handles. . . . **A month's work** in 60 seconds—that's what one firm is claiming for its transistor test equipment. Transistors are little individuals and to test each one for characteristics is a big job. This curve tracer gives all the answers in a brace of shakes. . . . **One enterprising firm** has reshaped its 50-lb aluminum ingots so that they lock together in three ways for easy shipping. Packaged in 40-ingot bundles they are cast with a wasp waist to prevent banding straps from slipping. . . . **Where are we going?** We received a release in the mail suggesting that tv's "Man of the Year" during 1958 was a device called Arbitron—that measures audience reaction instantly and accurately, in the home. We nominate it Mr. Snoop of 1958. . . . **Harping on service** — another company says it will work with a customer at any stage of his current project relating to design, development and manufacture of special gear boxes. . . . **Could be interesting** — the British Post Office are providing their telephone operators with nylon headgear that's so light the girls can forget they have it on. What we want to know is what happens when the girls do forget they have it on? We can imagine a few red faces. . . . **Dr. T. C. Tsu** a "You can

Continued on page 62

New engineering techniques are needed...

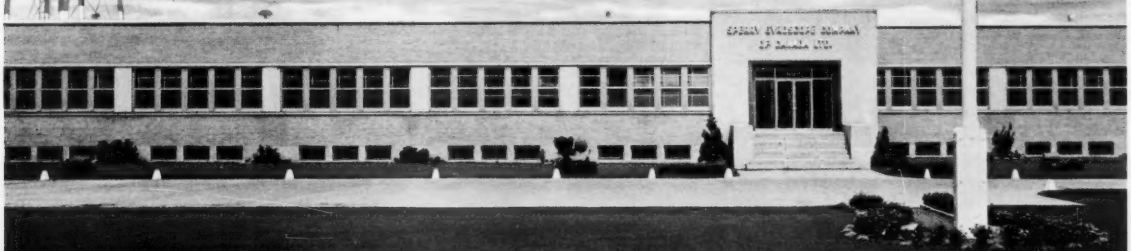
SPERRY discovers them!

ROTORACE*, a new engineering technique, now makes possible an extremely accurate low cost gyroscope. It reduces random drift rate to only 0.25 degree per hour. As low as 0.05 in laboratory tests.

Rotorace makes possible the accuracy of the Sperry LDG-1 Gyro for use where ultra precise navigation is required. The LDG-1 is currently in manufacture at Sperry Montreal plant for the R.C.A.F.

*T.M.

Sperry engineers are continually searching for new and better techniques to improve aeronautical navigation.



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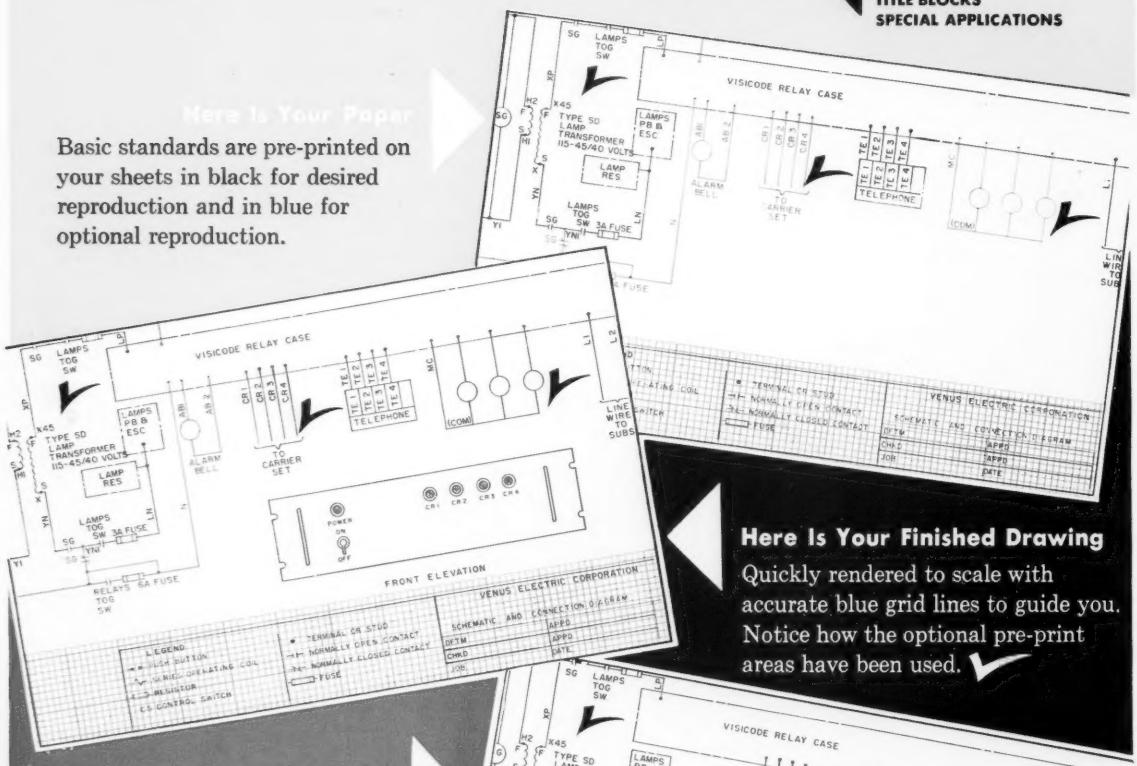

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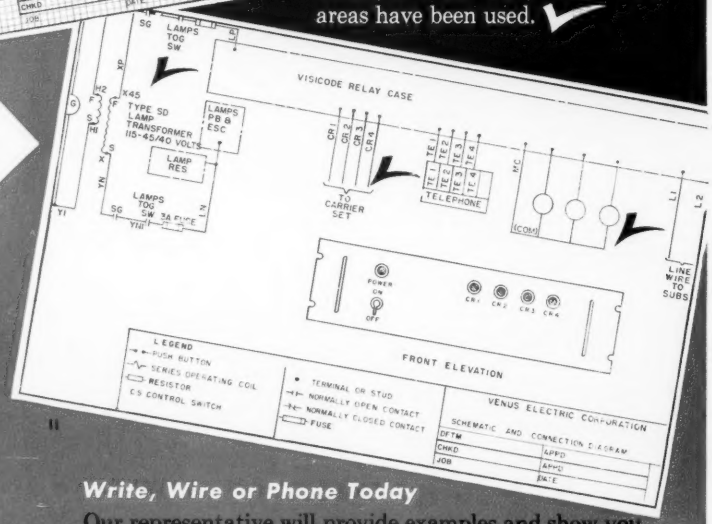

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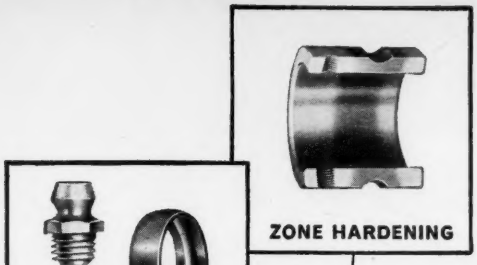

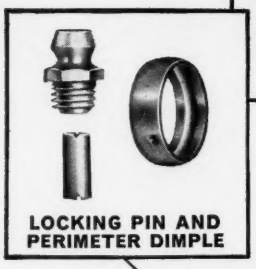

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Slip a SEALMASTER Ball Bearing Unit into place on the shaft—tighten two set screws and you have the answer to ease of mounting in a bearing unit. SEALMASTER'S exclusive combination of features take over from there, providing smooth, trouble-free performance and long bearing life.

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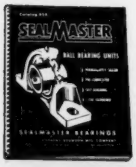

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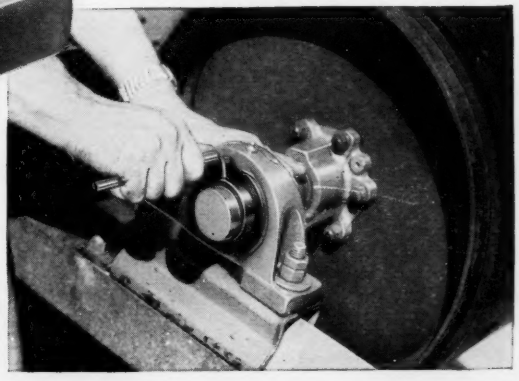

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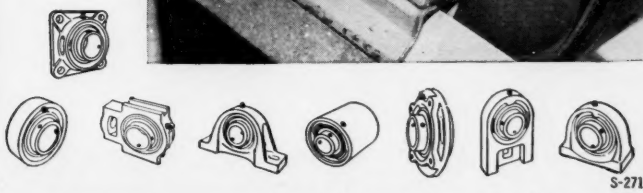


S-271-C

SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. OF CANADA LTD., BELLEVILLE, ONTARIO

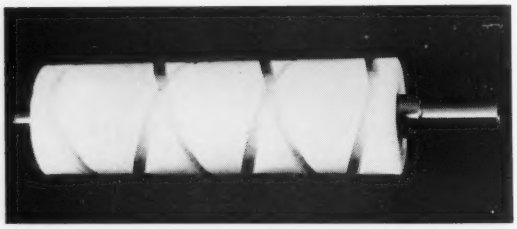
Circle number 143 on time saver card

Ideas round-up

Nylon cams: they make less noise — give output bonus

Engineers at Abbott Machine Co. replaced steel traverse cams with identical units machined from nylon 101 extruded rod in an attempt to reduce the noise level of their automatic traveling spindle-winder. What they did not fully anticipate was the huge bonus in increased output, improved products, less maintenance and lower operating costs that resulted.

From 40 to 250 cams are used on each winding machine for positively traversing a thread guide at up to 700 cpm. The thread traverse controls the formation of the package of "cheese" (as it is called in the textile field). Previously, the running contact between the hardened steel dog and the cam grooves produced considerable noise when the cams were run at high speed (up to 4200 rpm). One attempt to reduce the noise was made by using nylon followers. This successfully reduced the noise, but the steel cams wore the followers too rapidly. The final all-nylon design reduces the noise and increases the life.



Reports on machines equipped with the nylon cams show production increases as high as 40%. The lightweight cam accelerates to its top speed more quickly, with a resultant increase in the thread speed of from 625 to 875 yards a minute. At the same time, the higher operating speed is not objectionable, since the noise is less. The increased acceleration also distributes the thread more evenly on the package and so improves the winding quality.

Individually, the lighter cams will presumably improve bearing life, since the load is much less. This could, however, be offset by an increase in machine operating speed. The nylon cam winders have not seen enough service for the actual change in bearing life to be known. But, lighter loads, less slippage and more uniform acceleration should result in improved bearing performance. **(211)**

Dust-tight valves: stainless, compact with lift-out liner valve

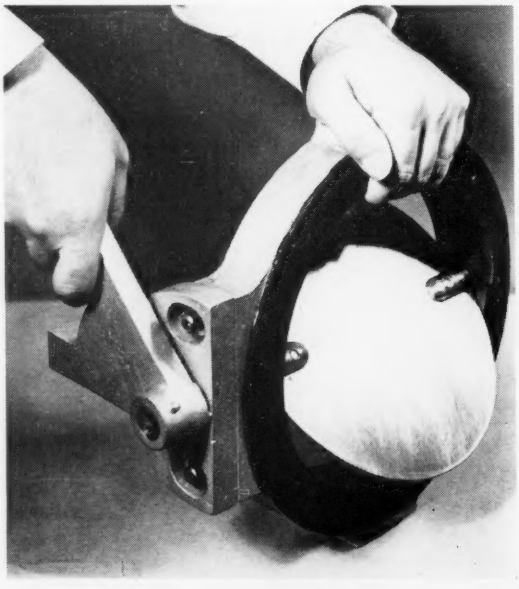
A dust-tight valve (the Solids Flow Valve) for use with general equipment processing or storing dry solids has been announced by The Patterson-Kelley Co., Inc.

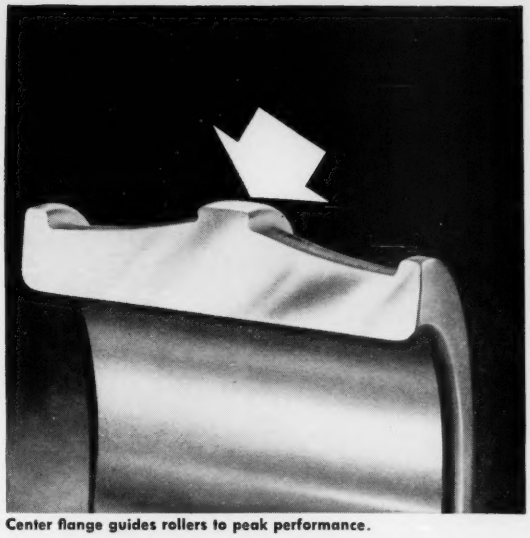
Compact and stainless, the valve is designed for equipment involved in blending, milling, conveying or other such operations, where the discharge and flow of dry powders and granulations must be controlled.

Available accessories include special adapters for mounting the new valve to existing equipment (including vessels now equipped with slide valves), a plastic bag adapter and a positive close-off cover for use on vacuum vessels.

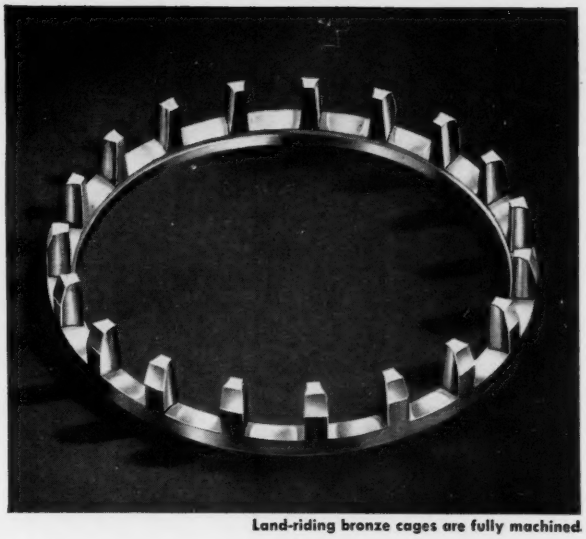
All components of the valve are precision-machined for complete interchangeability, giving low initial cost and easy field maintenance. The valve body is covered with a removable neoprene liner, and the vane and 0 ring sealed shafts are constructed of type 18-8 chromium-nickel stainless steel. All parts, including the neoprene liner, can easily be replaced in the field.

The discharge handle is operated against a radial, positive-positioning plate which locks the valve securely in position. Easy adjustments can be made for precise positioning and compensated positioning after long wear. Completely dust-tight, the new valve has been tested under a 20-in. head of water. **(212)**



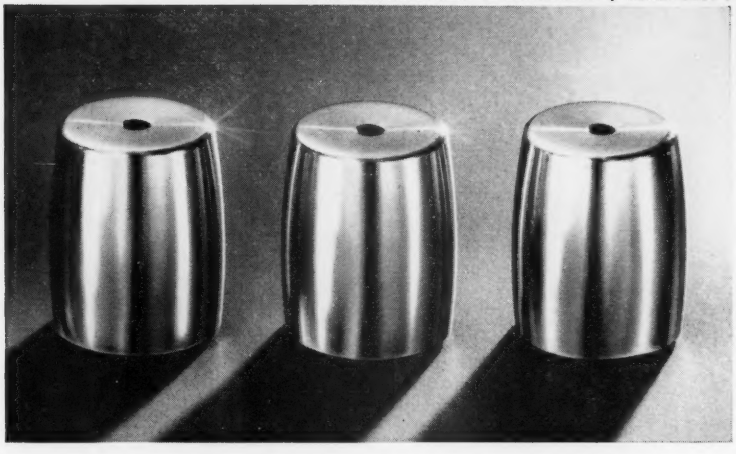


Center flange guides rollers to peak performance.



Land-riding bronze cages are fully machined.

Roller diameters are matched electronically within .0001".



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Torrington has compromised none of the operating design features of its Spherical Roller Bearing, because application experience has proved them essential to superior bearing performance.

There's no substitute for the stabilizing effect of the integral center guide flange. Torrington's asymmetrical roller seeks this flange under load. Skewing and stress concentrations are eliminated. Every roller carries its share of the load, for roller diameters are matched electronically within .0001" for even load distribution.

Rollers are precisely spaced by fully machined land-riding bronze cages that withstand even the high stresses of eccentric service. Two independent cages, one for each row, prevent roller drag and side stresses under thrust loads. Size-stabilized races prevent "growth" or change in dimension in service.

These features mean a cooler-running, longer-lasting bearing. When you buy bearings, look into *every* detail, and you'll choose Torrington. **The Torrington Company, Limited, 925 Millwood Road, Toronto 17, Ont.**

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- Asymmetrical rollers seek flange for positive guidance
- Electronically matched rollers
- Size-stabilized races
- Fully machined land-riding bronze cages
- Controlled internal clearances
- Even load distribution
- Inherent self-alignment
- Long service life

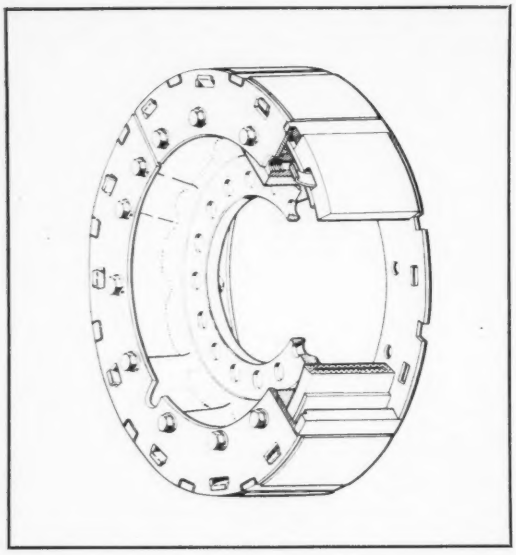
Send for new Spherical Roller Bearing Catalog No. 258

SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE • BALL • NEEDLE ROLLERS • THRUST

Circle number 148 on time saver card

"Hi-torque" brakes: total contact without deforming

The B. F. Goodrich Company is now producing a multiple shoe "Hi-Torque" brake. To make effective use of all lining contact (and to eliminate pressure peaks or variations) the length of each block is about the same as its width. This means that all the lining is able to contact the drum surface without deforming. There are no rigid connections between the lining and the actuation, to prevent the radial movement necessary for seating the lining surface on the drum surface. Each lining is confined from axial movement by side frames, and the lining is a leaf spring that applies a force to the linings toward the centre of the brake, to give positive retraction on releasing the brake. The brake actuation is, in effect, a flexible hydraulic platform providing complete freedom for lining contact. The torque developed by each lining is opposed by torque bars welded into the side frames. These torque bars and lining elements are evenly distributed about the 360 deg of brake circumference. The actuation is by a full-circle, hydraulic expander-tube made of fabric-reinforced neoprene; this imparts a direct and equal pressure to all linings. As the linings are not continuous at the torque bar locations, a steel shoe is riveted to the lining base.

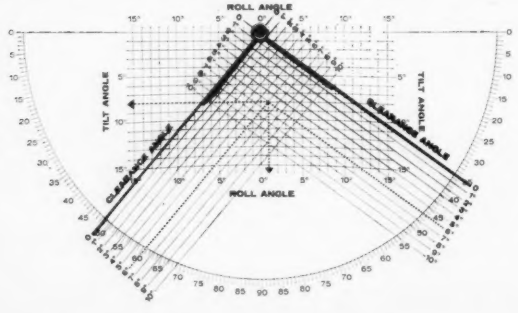


When pressure is introduced into the expander-tube, the linings move out radially to contact the drum with equal pressure, because all activation is from one hydraulic chamber. At no point in the brake-drum does the lining pressure ever exceed the brake pressure, as contrasted with the uneven pressure pattern over the length of a fixed-anchor, rigid shoe. By controlling the amount of fluid leaving the brake, retraction of the lining is controlled. By this means, brake adjustment or lining clearance is maintained. As uniform pressure is exerted around the entire brake and self-energization is eliminated, uniform torque will be developed around the entire brake and dispersed evenly through the frames and torque plate. Since the loading is a pure torque, there is no bending in the axle or axle housing.

(From an SAE lecture by P. A. Smith and P. F. Black)

Micropoint calculator: sidesteps errors

The micropoint calculator (supplied with the De Vlieg micropoint grinder) saves time and eliminates calculating errors. The illustration shows the calculator set to represent a 49 deg and 35 deg tool angle, this being read off by the broad black lines. Other known factors are the clearance angles, the intersecting point of which indicates the roll and tilt angles to be set on the tool grinding machine.



Example: 49 deg and 35 deg tool angles, and a 6 deg clearance angle will require a 1 deg roll angle and 8 deg tilt angle (as indicated by the arrow-heads).

It should be explained that the micropoint grinder is a small, specially-designed, tool-grinding machine for the maintenance of microbore and other tools.

The machine is fitted with a work slide arrangement for grinding either the conventional cylindrical (variable relief angle) or conical (constant relief angle) tool point. All main slides are of cylindrical form, and direct-reading dials or scales assist in setting the tool point radius, radius offset, lead cutting angle and end cutting edge angle.

The machine is particularly useful for stylus grinding, as the exact reproduction of the shape of the tool to the shape of the stylus can be obtained and easily duplicated. (214)

How can your customers Know ...unless your product can COUNT?

How can they know that they're getting out of your product all the performance you build into it — unless you *also* build into it a Veeder-Root Counter as a standard part? Then they have a running record of performance that shows them where they stand every minute of the working day . . . and a record that proves your product's guarantee. What's more, it gives you a new plus in selling.

How to build it in? Count on us to show you. Write, or phone JAckson 7-7201.

You always "Know the score" when you count on Veeder-Root!

Vary-Tally Multiple Unit Hand-operated Counter. Easy keyboard action. All units on same row reset instantly to zero with one turn of knob. Supplied in practically any number of units, in any arrangement.

New High-Speed Predetermining Counter, Series 1522, features instant lever reset plus quick and easy setting of predetermined number. Speeds up to 6,000 rpm. Also supplied without predetermining feature.

New "Count-Pak", a complete electronic counting package for use where high speed, long life and instant reset are required. Rated at 20,000 counts per minute (with added decade speeds run up to 200,000 cpm). *Completely transistorized.* Photohead adaptable to any job. Several other "Count-Paks" available.

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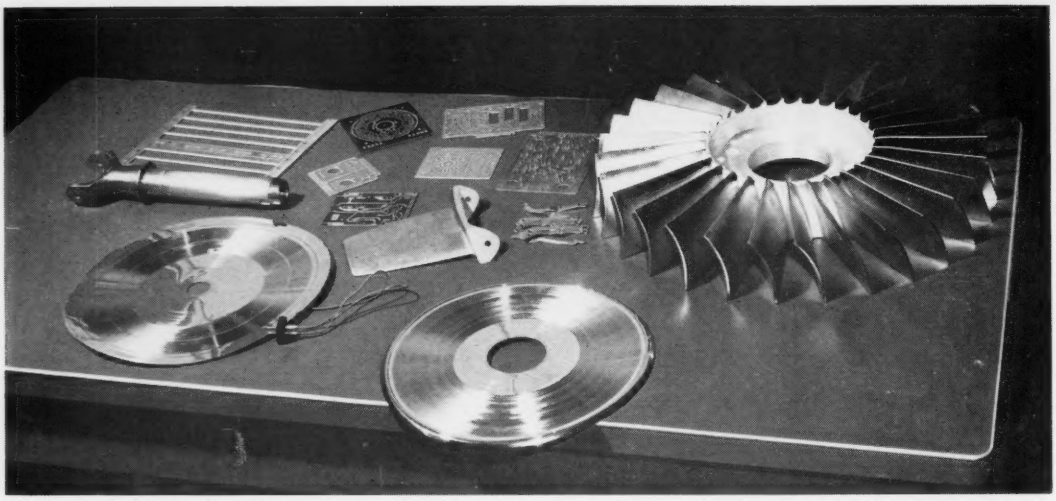
Circle number 151 on time saver card



These parts plated with sulfamate process include jet engine inducer, printed circuits, and electronic contacts.

Nickel plating using sulfamic solution

This short case history shows how experimentation pays off. Result: platers can now buy ready-made solution, add anodes and switch on.

Staff written feature

About ten years ago, Richard C. Barrett began experimenting with electroplating as an engineering tool, rather than as a way to get a decorative finish. He soon concentrated on nickel, because of its properties of corrosion resistance, hardness and high service temperature.

Ordinary plating solutions weren't acceptable, he found, for certain special applications. The baths produced nickel deposits with internal tensile stresses as high as 60,000 psi. (This type of stress in many applications causes peeling, cracking, warping and other distortion of the plated metal.)

The best solution turned out to be a formulation based on sulfamic acid.

Operating under a Du Pont patent, Barrett perfected his method until he could even induce desirable compressive stress in nickel deposits. Further experiments showed that the nickel was ductile and that the bath increased plating speed about four times. The solution was safe to use with simple precautions, too, since sulfamic acid is relatively non-toxic and doesn't fume.

The bath is now standardized to a point where Barrett Chemical Products Co. supplies specialty platers with a ready-made solution. About all they have to do is add nickel anodes, hang the part in the bath, turn on the current and start plating.

Aircraft designers have solved several premature fatigue failures by using sulfamate solution. Sand and fine gravel nick jet engines compressor blades and set up stress corrosion that leads to fatigue failure.

The life of these parts can be increased by depositing 0.014 in. of nickel on the leading edges.

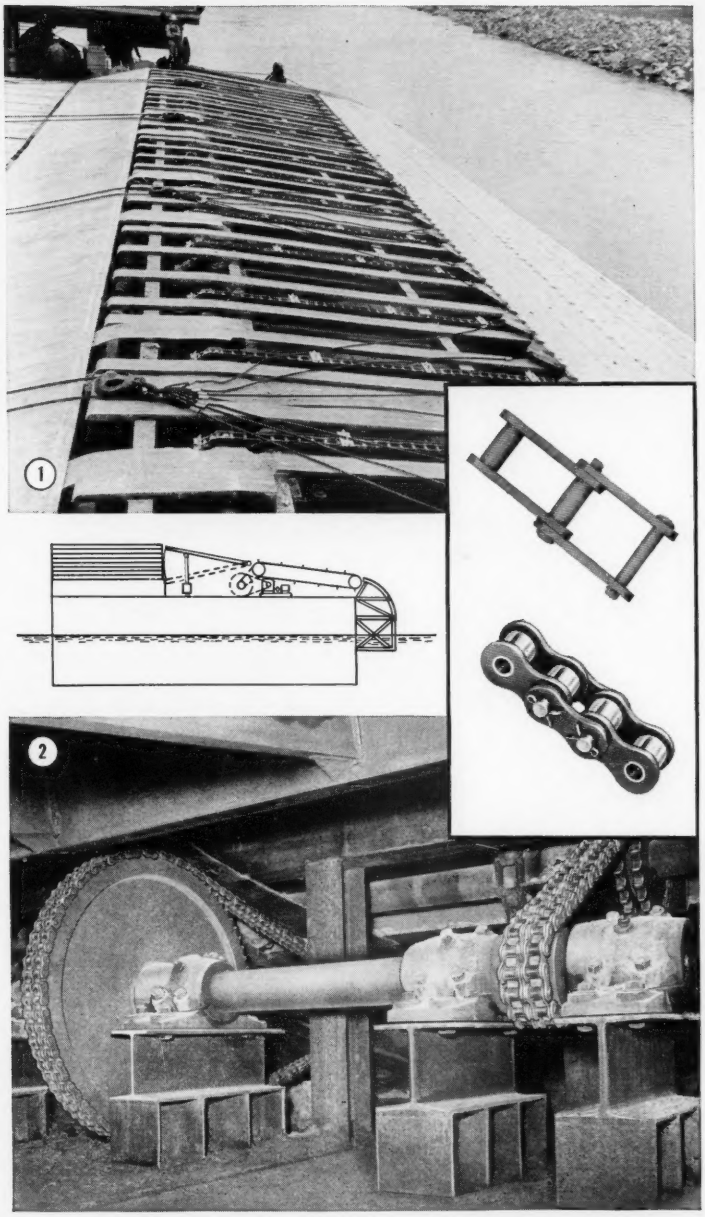
The plating process can be controlled to deposit nickel of varying thickness on the same part. For example, that 0.014 in. of nickel on the leading edge of the air inducer blade thins down to 0.002 in. on the trailing edge, thus saving metal where it isn't needed. This technique can be used to build-up worn or badly machined parts, too.

Makers of printed circuits on plastic boards say the process has helped broaden the uses of their products. Because the sulfamate nickel is free of tensile stress, the metal doesn't lift off the plastic. It is also possible to plate through holes without difficulty. This can't be done with other processes. Rhodium (which has even better wear-resistance than nickel) sticks to it, so for the first time it is possible to build successful printed circuits with rotating contacts.

Other parts prominent on the list of those currently being plated in sulfamate nickel baths are: typewriter hardware, spray masks, injection molds and the master molds used to stamp out phonograph records. ★

The process is used in nickel-plating rifle components.

In chain— get choice . . . not chance!



LINK-BELT's complete line gives positive answers to specific design questions

Usual tunnel construction requires that a shaft be bored and lined through bedrock. The Deas Island Tunnel, however, is made up of precast tunnel elements sunk into a trench dredged into the bottom of the Fraser River. This unique method called for the tunnel to be covered with concrete erosion mats and a layer of rock fill. It also required a solution to the problem of laying these mats. Kiewit-Raymond and B. C. Bridge & Dredging Co., Ltd. couldn't take a chance. They called on Link-Belt.

A CHAIN REACTION

Link-Belt engineers responded with SS-102B Class bushed chain. Mats are piled on one side of a barge, pulled off the pile over an adjustable ramp onto the chain conveyor. They go over the side and are laid at approaches to the tunnel 38 feet below. Power transmission is supplied by Link-Belt Roller Chain Drives.

A COMPLETE LINE

Chances are, Link-Belt offers a chain with the exact characteristics demanded by your job. No other single source can equal Link-Belt's broad range of cast, combination, forged and fabricated types plus roller and silent chain.

You can be sure that Link-Belt chain is made to the highest standards. Link-Belt's modern plant facilities assure greater accuracy of manufacture. Exact control of materials and processes give increased uniformity . . . longer chain life.

You can get further facts from your Link-Belt office. Put in a call today.

① **MAT OVERBOARD**—Conveyor consisting of 16 strands of Link-Belt SS-102B bushed chain with special spur attachments makes this method possible. SS Class bushed chain is also ideal for heavy-duty elevator service.

② **DEPENDABLE POWER**—Link-Belt RC 120 roller chain (at left) drives countershaft. Link-Belt RC 160 roller chain drives headshaft at right. Available in single and multiple widths, ¼ to 3-in. pitch.

LINK-BELT

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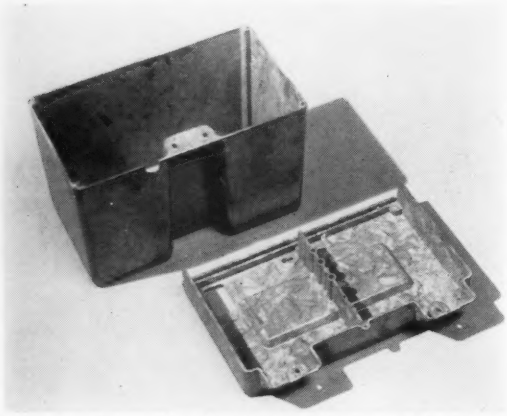
Circle number 123 on time saver card

High-impact phenolic molding

This reinforced phenolic molding compound has high-impact features. It is produced in dry, easy-to-handle form and consists of ½ in. and 1 in. rovings impregnated with phenolic resin. Typical applications are shown.

Information, photographs from Hooker Chemical Corp.

Impervious to rust, corrosion, acids, soaps and oils (say makers), this molded pump base allows manufacturer to guarantee years of service to the potential customer.



Parachute boxes for the US Army are molded with the new material. It was chosen for this tough assignment because of its high impact strength and also its rigidity.

Pay off for Chrysler came when company engineers decided to develop this material for oil pump gears Saved: two thirds cost new unit outwears old 3 to 1.

This automatic transmission clutch cone was molded directly to close tolerances, without further machining. It transmits full engine power to the rear wheels of car.

For better moulding...choose FORTICEL†

A new application in Canada . . . stock 3-inch numerals and letters in red, black, or white by *Hanson Plastics Ltd.*, 1751 West 3rd Ave., Vancouver, B.C. Durable, weatherproof, strong . . . these are ideal for boat registrations, fences, signs, store window lettering, just to mention a few. Letters may be nailed without pre-drilling or permanently bonded to any surface.

Another example of new products and design improvements inspired by Forticel. Forticel possesses many desirable features . . . toughness, dimensional stability, surface beauty, and freedom from objectionable odour.

Forticel could be best for your application.
For further details, contact:

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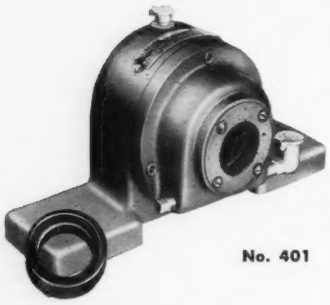
Chemcell PLASTICS

Circle number 110 on time saver card

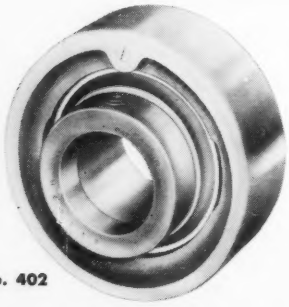
product news from — United Steel
CORPORATION LIMITED



No. 401

Transmission Unit for High Temperature Locations

Specially designed for applications involving higher than usual temperatures, Fafnir SAL type (standard) and SAOL type (heavy series) ball bearing power transmission units, utilizing water-cooled end covers, have been successfully mounted in close proximity to ovens, fans, etc. which have had inside temperatures as high as 1,500°F. The amount of water used is small; the flow through a 5/16 in. copper tube generally being quite sufficient. The bearing lubricant is kept cool by this method, thus avoiding a breakdown of the oil even when the bearing housing is close to the exterior of the oven wall or fan housing.



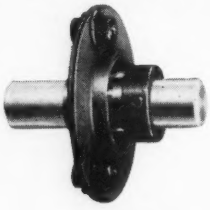
No. 402

Cylindrical Cartridges

Developed for ease of application, Fafnir Cylindrical Cartridges are convenient units for mounting in straight bored housings. All types incorporate a Wide Inner Bearing with Self-Locking collar and spherical outside diameter which is fitted to a corresponding spherical seat in the cartridge to provide self-alignment.

Low Cost, Self-Contained Ball Bearing Unit

Users can obtain the advantages of ball bearing performance at a new low cost with recently-introduced Fafnir Flangettes. The unit is comprised of two interchangeable pressed steel flanges which house a standard Fafnir Wide Inner Ring Ball Bearing with the exclusive Fafnir Self-Locking Collar, providing a complete, inexpensive housed unit for light duty, slow speed applications. They are compact, easy to mount, self-aligning, and pre-lubricated ready for installation. They are available equipped with either Plya - Seals (contact - type) or Mechani-Seals (slinger-type).



No. 403

Ball Bearing Unit Features Current Conducting Rubber Cartridge

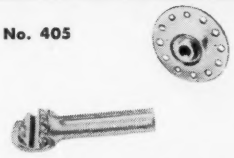
The Fafnir Type RCSM rubber cushioned ball bearing unit features the Fafnir Super-Quiet Ball Bearing plus a specially developed electric current-conducting rubber cartridge that eliminates need for grounding springs or clips. Available in an OD size range designed to make bearings readily interchangeable with sleeve bearings in popular spider-type brackets. Wide range of bore sizes.

No. 404

Aircraft Bearings Solve Many Commercial Bearing Problems

A series of ball bearings developed by Fafnir to meet the special and exacting requirements of the aircraft industry has found wide and rapidly broadening usage in many commercial applications where motion is reciprocating rather than rotational. Manufacturers of farm machinery, railway lighting equipment, lawn mowers, automatic machinery and other types of equipment have found the solution to a bearing problem in the Fafnir Aircraft Series.

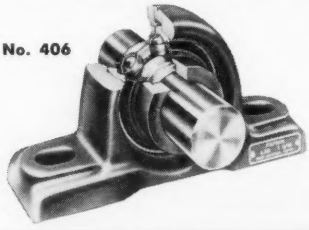
No. 405



Pillow Block for Normal Load Applications

Recommended for all general industrial applications where normal loads are encountered, Fafnir LAK Type pillow blocks offer many positive advantages. Compact, one-piece housing can be mounted in any position. Fitted with deep-groove single row wide inner ring bearings which are designed to carry radial thrust or combined loads, and frictionless, integral Mechani-Seals for effective retention of lubricant and exclusion of dirt. The unit is pre-lubricated ready for immediate installation.

No. 406



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Circle number 150 on time saver card

Keeping informed

New booklets and technical data for you to read

"Electronic Poem" — light, sound and electronic system of Le Corbusier's phantasmagoria is described in Philips Technical Review Vol. 20, No. 2/3.

Insulating sheet material—a 16-page brochure describing Marinate, a fireproof, insulating sheet material, has been published by Johns-Manville. Other folders available on Pre-Klad and heat resistant electrical insulations.

Centrifugal compressors—bulletin 165 (Clark Bros.) tells the story of their single stage equipment for petrochemical and refinery applications.

Fans and blowers—handy loose-leaf booklet of 36 pages describes the various applications for McLean fans and blowers for electronic applications.

Idea file—well thought out and presented kit published by Gray Iron Founders' Society lists a host of design problems and comes up with a solution every time.

Library index—Alloy Metal Sales have compended an index of modern metals. Obviously a lot of work has gone into it and it will probably become well-thumbed with use in many design offices.

Retaining rings—plenty of information highlighted with illustrations is contained in a 24-page catalogue published by Waldes Kohinoor. RR 10-58 is the number.

Castings handbook—If you're responsible for materials specification or selection, a 76-page stiff-backed book on this subject can be had from Malleable Research and Development Foundation.

Correlation charts—plenty of information about stainless steel including trade names and tables of compositions. Rogers Publishing Co.

Shock and vibration—Voss Belting and Specialty Co. have produced a brochure on shock dampening and vibration-isolation.

Silicones—1959 reference guide shows application and characteristics in a straightforward manner. Dow Corning Silicones Ltd.

Control panels, battery chargers and motor generator equipment is covered by Powertronic's general catalogue.

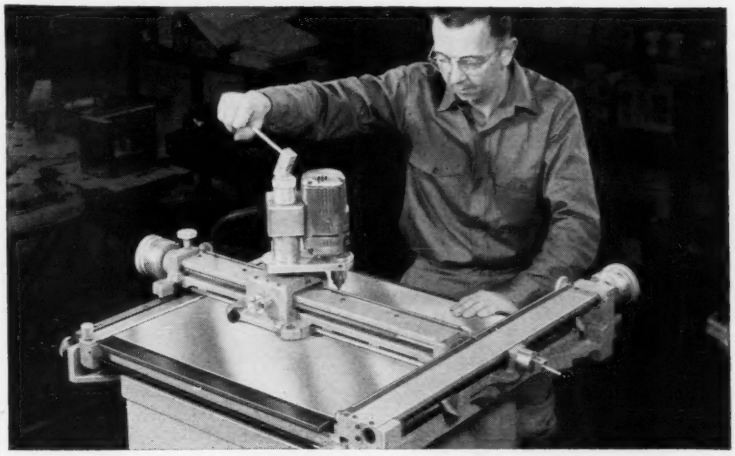
Precision sapphire products—design data, jewel bearing assemblies plus plenty of related information in this Aurele M. Gatti Manual No. 5.

Air circuit breaker—publication 31-132 (English Electric) describes a compact low voltage air circuit breaker.

SAE preprints—light weight highway tractor design (23R); rotary valve steering gear (19S); metallurgical developments in brake drums (14S); aluminum

Continued on page 71

layout and template making time cut in half . . .



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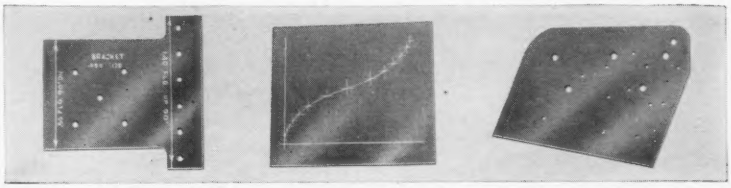
- **DRILLS, REAMS, SCRIBES, CENTER PUNCHES** to ± 0.002″ WITHOUT base line drawing or height gauge layout!
- **EASY, ACCURATE POSITIONING**—quickly set to any reference point and to nearest 0.100″ by adjustable steel tapes reading in both directions from zero. Micrometric gauges then bring settings to nearest 0.001″. No optical scanning device needed.
- **LASTING ACCURACY!** Table is an actual ground surface plate. Bridge assembly is of heavy, accurately machined castings. Lead screws are precision ground and engaged only during micrometric gauge settings to minimize wear. All parts are corrosion-resistant. Bearings are protected against dust and chips by felt shields. Drill motor is heavy-duty industrial type.
- **¼″ CAPACITY** in mild steel — stock up to 24″ width, any length.
- **ALSO A PROVEN MONEY-SAVER** on pilot runs, low unit production.



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Circle number 146 on time saver card

New products & materials

Parts in a basket

Illustration shows the "Multi-shelf" carrier, a convenient method of handling precision parts. Basket features removable wire shelves or trays that may be moved from the sides. Primarily designed to suspend individual small precision parts for protection of exposed surfaces during handling, processing, degreasing—they can be put to many other uses. **Mid-West Wire Products Co.** are the manufacturers. (215)

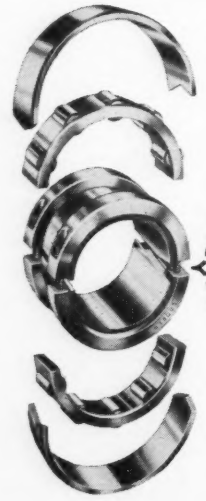
Zero backlash mini-joint

The makers of this universal joint say it provides greater freedom in instrument design at low mechanical power levels. Sealed-in lubrication, maximum operating angle of 30 deg and zero backlash are some important design features. Typical applications are synchros, resolvers, mechanical indicators, repeaters, potentiometers, sub-fractional-hp motors. Torque ratings are available up to 64 in.-oz. **Canavia Engineering and Sales** are distributors. (216)

SAVE "DOWN TIME" WITH

COOPER

split ROLLER BEARINGS



Split right down to the shaft

Cooper Split Roller Bearings have all the advantages of conventional roller bearings, PLUS being SPLIT—right down to the shaft! For mounting, Cooper bearings are assembled around the shaft—not pushed or pressed on the shaft. They may be mounted where it is impractical or impossible to mount conventional solid race bearings.

The unique SPLIT feature saves "down time", money, and space. With Cooper bearings you get all the advantages of regular roller bearings with a Big PLUS!

Superb construction, high load-carrying capacity, and long life make Cooper Split Roller Bearings the first choice with designers and maintenance engineers.

Why not find out for yourself? Send for the latest catalogue and see what Cooper's big PLUS can do for you.

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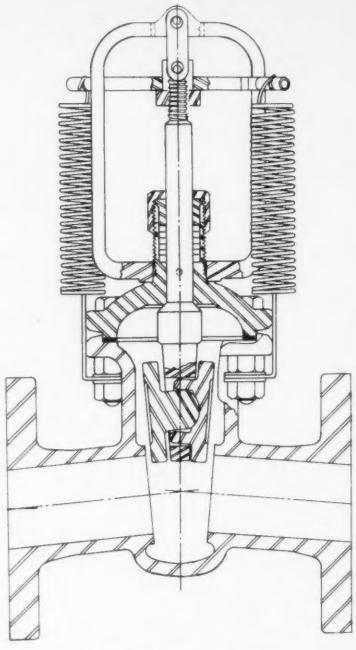
Circle number 145 on time saver card

Fire protection gate valve

Four increased temperature range fusible links have been added to the range of



stainless steel fire protection gate valves manufactured by **Cooper Alloy Corporation.** They increase the melting points up to 360 deg F. When the link melts, the springs are released (see diagram) and the valve is immediately closed to prevent any further fluid from feeding into the network. A rotating double disc assembly designed into the valve maintains a tight seal should the body distort at elevated temperatures. (217)

Briefs—(Continued from page 48)

be sure" aerodynamicist says rockets may be old-fashioned for getting about in space. After the first 1,000-mile kick-off all man needs is a sheet of aluminum foil or plastic 1/10,000-in. thick to catch and use the sun's propulsive power. How does he use the foil — well as a sail of course—don't be retrogressive . . . ★

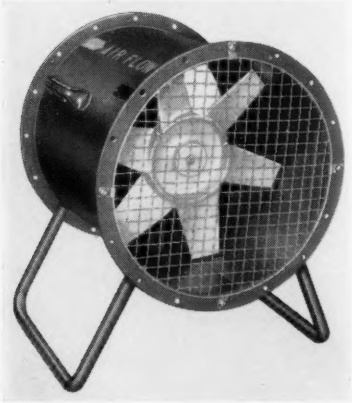
Brief Talepiece—Here's an idea for the file—in fact it's a coffee-making machine that looks like a file. Open the second drawer of the "file" and out pops a service shelf with cups. When the last worker leaves the office it stops making coffee — doesn't start again until next morning. And it knows enough not to perk on weekends or holidays. We wonder if this heralds another race of people —"the secret second-drawer addicts of File Number Thirteen. ★

New products
Continued

Terminal block
Makers say that Modulok, a new modular principle terminal block, has already found numerous applications in early warning electronic systems, and missile ground control systems. Individual modules can be snapped together (or apart) and then inserted onto a steel track and locked by end locks. Every foot of track will take 30 modules. Latter have either two or four-tier spring-loaded sockets which may be set for quick-disconnect for rapid ring-out, bussing, or circuit changes. **Burndy Canada Ltd.** (218)

Aircraft oil gauges
Gits Bros. Mfg. Co. have introduced a new series of screw-mounted gear case oil gauges. They are specifically designed for aircraft applications and permit instant check of the oil level within transmissions or gear cases. A specially compounded plastic sight is backed with a cadmium-plated reflector which clearly reflects oil level, even in dim light, according to specifications. Standard line comes in five sizes with sight diameters from ¾ in. to 2 in. (219)

Industrial fans
A new line of pressure-type tubeaxial fans designed to handle air, fumes, and light dusts encountered in industry, has been developed by **Propellair.** Fans have matched propellers and motors, the former ranging from eight through 24 in. diameter. Capacities range from 200 to 12,000 cu. ft. per minute. Special equipment models are also available. (220)



Colored knobs for slide switching
The function of these colored knobs is to add greater visibility to important switch functions on radio and TV receivers, audio equipment, instruments, and small motorized appliances. They come in nine colors and features include one to four poles with up to four positions. The Electronics Components Division of the **Stackpole Carbon Co.** have a wide variety of such switch equipments. (221)

Torque actuators
Now available on the Canadian market, this oscillating motor (**Tork-Mor Inc.** makes it), obtains power from hydraulic or pneumatic pressure. It is mainly used for producing reciprocating rotary power for pulling, pushing, mixing, transferring and similar movements. Standard models range from 3-in. diameter motors to 12 in. diameter—the largest with torque of 215,000 in./lb. (222)

Converter transformer
A new series of converter transformers permits conversion of low-voltage direct current to high-voltage for operating mobile and military electronic equipment. All transformers are hermetically sealed and constructed in accordance with MIL-T-27A Grade 4, Class R, 10,000 hour minimum life. Manufactured by **Microtran Co., Inc.,** they can draw full wave and C.T. loads simultaneously. Over-all full-load efficiency is 80 to 90% when used in circuit similar to this diagram. Output voltage to input of rectifier is a 1,600-cycle nominal square wave for ease of filtering. (223)★

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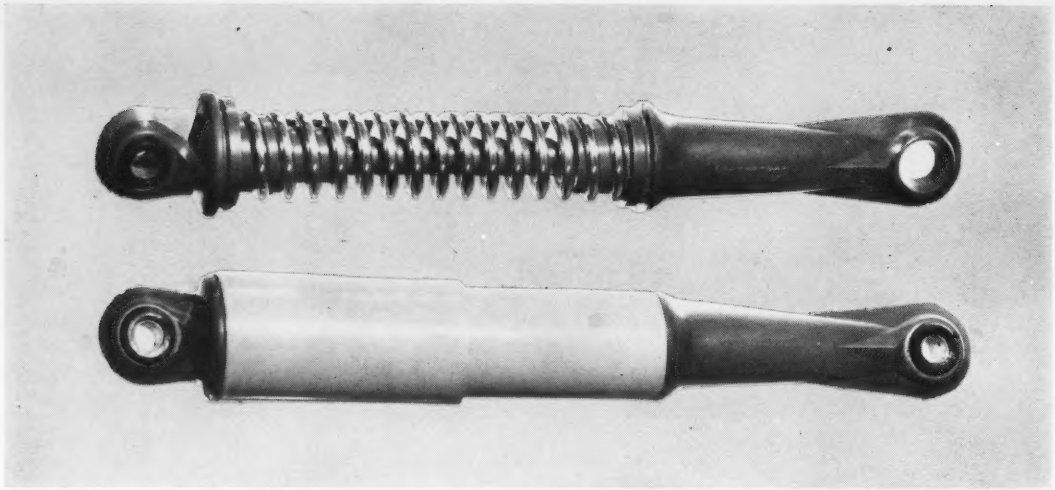
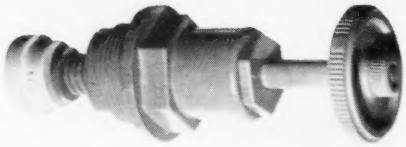


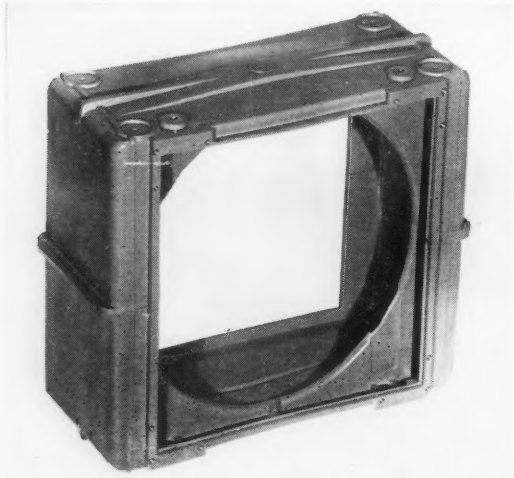
Motorcycle shock absorbers. Dr. G. Natta of Milan did pioneering work with stereospecific catalysts and polymers.

Polypropylene — a plastic newcomer

Coffee grinders, hypodermic sterilizers, hair dryer and personal vac. cleaner made of isotactic polypropylenes



Valves and fittings, injection molded of new material show resistance to strong acids, solvents and grease



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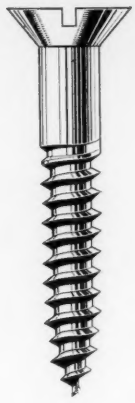

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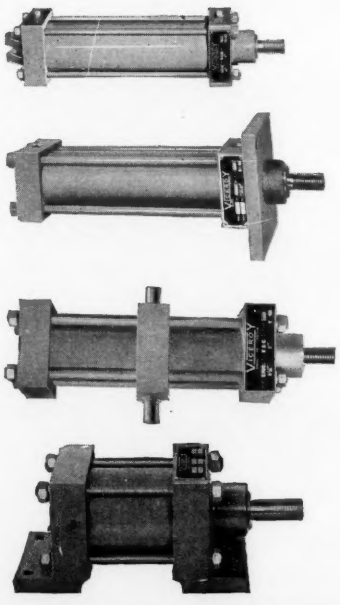

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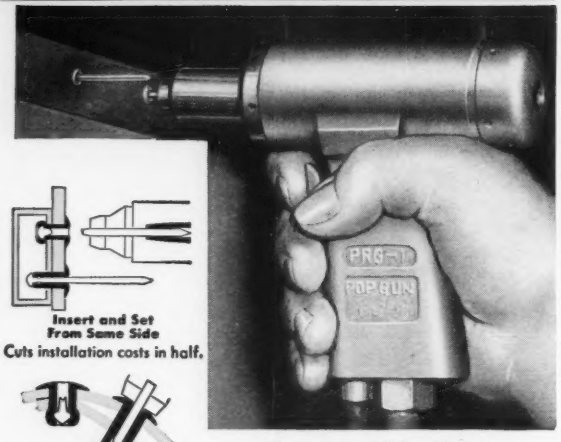

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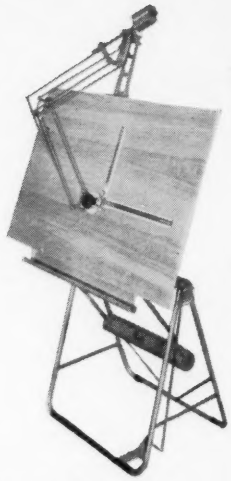

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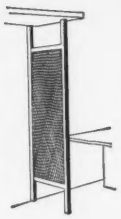

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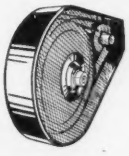

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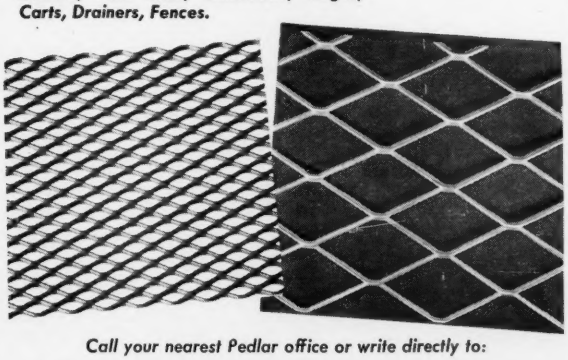

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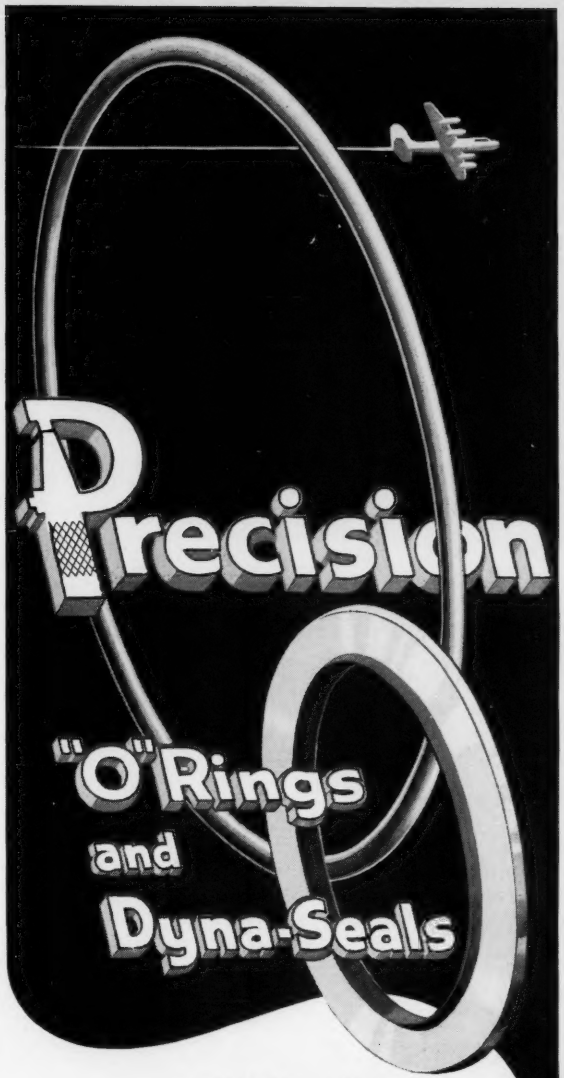

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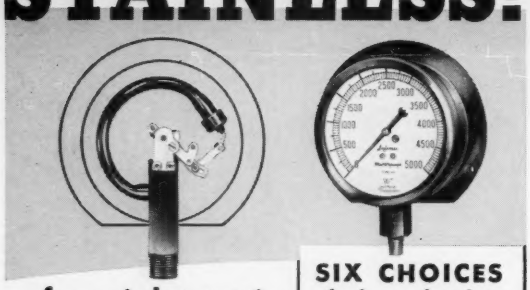

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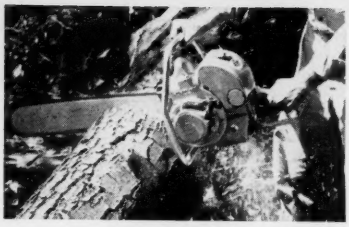

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Keeping Informed

continued

and today's brakes (14R); glass as structural member in auto bodies (11R).

Phenolic products—this eight-page brochure describes General Electric Co.'s line of phenolic resins, varnishes and molding powders.

Flexible hose and fittings—just published is catalogue 201, an easy-to-read 60-page presentation by Stratoflex of Canada. Profusely illustrated.

Measuring systems—another publication that gives information galore. It deals with physical test machines, stress analysis equipment, radiography and ultrasonic instruments.

Temperature-millivolt tables—this is for thermocouples and makes it possible to convert either F or C temperatures, in five deg. increments, to millivolt values for eight different thermocouple calibrations in a matter of seconds. Thermo Electric publish this wall or binder chart.

Aluminum casting alloy—design and casting information of Tens-50 published by Navan Products Inc.

Electrical equipment—just off the press are some new Dowty equipment leaflets. They describe lever switches, warning lamps, magnetic indicators and others.

Sound control—a handsome brochure by the Koppers Co. tells how you can kick up one heck of an industrial row without having your neighbors try to lynch you.

Plastic molding materials—this 12-page booklet contains complete property and molding data charts for Mesa Plastics Diallyl Phthalate materials.

Gear couplings—lots of information for you if gear couplings are your current or perennial interest. Dominion Engineering Co. publish this 20-page, illustrated work.

Line strainers—bulletin F-36 doesn't blow the Jordan Corporation's trumpet. But in its short form it does tell you about woven screen mesh line strainers, which is more important.

S.M.P.T.E. Meeting

The next meeting of the Toronto section of the Society of Motion Picture and Television Engineers will be at 8 pm, Thursday, March 12, at the Caldwell Queensway Studios — 1640 Queensway.

The meeting, which should be of interest to many design and test engineers and technicians, will feature six speakers — many of whom are engaged in medical, industrial and defense research. They will talk about (and demonstrate) the ways in which they use motion picture cameras and materials as tools for measuring and analyzing time and motion.

This promises to be an interesting evening, and nonmembers are invited to this special meeting either as guests of members or "on their own."

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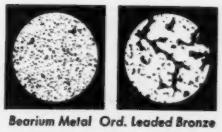

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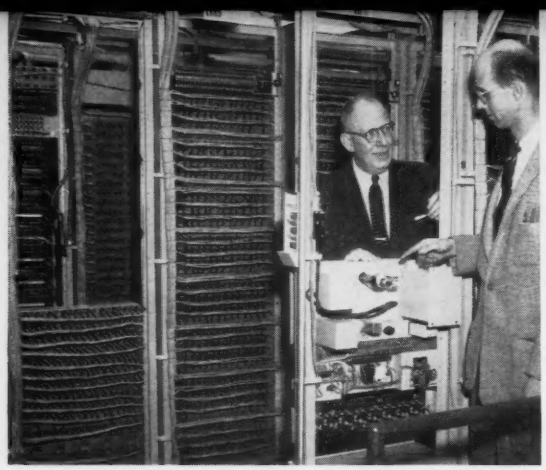
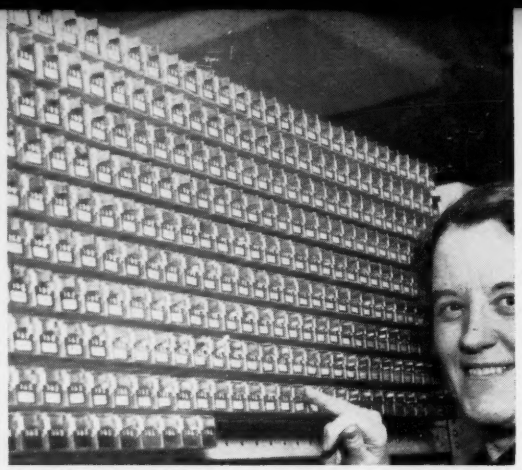


Part of equipment room: Mr. George McKeown is at left.



A bank of registers for every cashier in the RY hotel.

PBX has yellow lights, tiny registers

Eric Haworth *Assistant Editor*

George McKeown closed the filing cabinet drawer and handed me the plan. "This is the original drawing we made for the new installation. Notice the date it was made, by the way — December 6th, 1956." We were in the telephone equipment room of Toronto's Royal York Hotel, and Mr. McKeown had just shown us around the largest and most modern hotel PBX in Canada. The system was inaugurated three weeks before the new 400-room wing was opened.

Three of the most interesting design features are also the talk of the hotel. They are —

- dial within a dial
- message waiting lamp
- automatic "registers"

In the special inspection arranged for DE, we were able to see how these operations worked. As the photograph at bottom left shows, the dial face of the Royal York phones is different. It has the usual numbers and letters, but also listings for room service, valet, garage and similar services — all of which can be dialled direct by the guest. This feature alone has endeared the system to the hotel switchboard operators.

To best understand the advantages of the system, imagine yourself a guest at the hotel. You have been out on business calls during the day, and when you return to your room the little yellow light on your phone is glowing. This means that someone has been trying to reach you. To collect the information, all you do is dial the message desk. It's positive, quick and foolproof.

During your stay you've also made lots of phone calls, but haven't bothered to keep tabs on them. Well don't worry — all the calls have been counted and charged automatically. (Every time you dialled "8" for long distance for example, your call was routed to the city long distance board and a Bell Telephone operator checked your room number. On call completion, the operator reported charges to a toll clerk who transmitted it to the hotel via teletype).

All calls are counted on little machines called "registers" — one for each of the 1513 guest rooms. The hotel cashiers have a panel of these registers over their cash drawers. When you check out, she refers to your individual register to find out how many calls you made. No guesswork or paper chits to bother with. When you've paid your bill (don't forget the receipt for tax relief), the cashier merely pushes a button on the register to reset it for the next occupant of the room. This feature is one of a kind in North America.

The complete system took two years to design and construct and is the work of telephone engineer George McKeown. We asked him how much wire there was in the equipment. "About 50,000 miles of it altogether," he said. "Then there are the connections — 4 million of them. We designed the equipment around standard components for cost and servicing advantages. Apart from the automatic registers which were made specially for us, everything is standard."

There are many interesting design facets other than those we have mentioned. It's a three-in-one system — that is there are 1600 phones for guest rooms; another 300-block for administration; service lines make up another 100. The boards have room for future expansion.

From what we discerned, too, George McKeown's PBX design might be the forerunner of a new era in upgrading hotel switchboard services on this continent. ★

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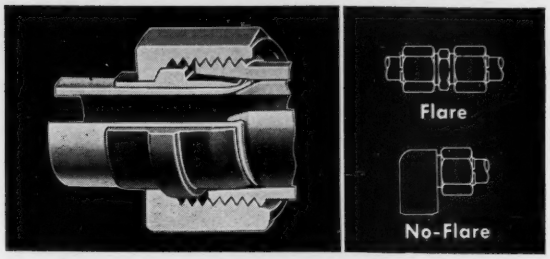

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The Easy Installation Of A No-Flare Fitting — no time consuming flaring operation — no flaring tools required. Can be used with heavy-wall tubing and, provides a seal on the OD of the tube.

The Efficiency Of A Flare Fitting — Can be used on thin wall tubing — provides a seal on the ID of the tube.

- Easy Assembly — "Rock Bottom" stop signals that joint is sealed.
- Double Seal — seals on both OD and ID of the tube.
- Lower Cost — FLODAR'S Self-Flare fittings cost less to buy and install.

You gain the advantages of both flare and no-flare fittings with none of the disadvantages . . . when you switch to FLODAR Self-Flare tube fittings.

Tube shearing and work hardening are eliminated . . . FLODAR Self-Flaring fittings can be reassembled time after time without fear of leakage or damage to tube and fitting.

Priced competitively, this fitting is available in tube sizes from ⅛" to 2" and in steel, stainless, brass and aluminum.

Write for FLODAR Fitting Catalog.

FLODAR Corp.

16911 ST. CLAIR AVENUE • CLEVELAND 10, OHIO

Canadian Distributors—ARVIS ENGINEERING, LTD., 1105 Royal Avenue, New Westminster, British Columbia, Canada • MARSHALL EQUIPMENT CO. INC., 61 O'Connell Ave., Dorval, Quebec, Canada • NORTHERN HYDRAULIC SERVICE, LTD., 5710 - 103A St., Edmonton, Alberta, Canada.

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are manufactured to meet the spread of miniaturization and high precision limits required in many fields of Canadian industry.

A complete range of B·M·B Mini-bearings in both metric and inch sizes, which include flanged, shielded and pivot types, are available. Bore diameters range from .03937 inches up to ¼".

Bearings are manufactured to American ABEC specifications.

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B·M·B also manufacturers of Steel Balls from .003" up to ¾".

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FACTS YOU should know about malleable iron

FACT No. 5 . . .

Resistance to Corrosion

By actual experience and by laboratory tests, malleable iron has proven to have remarkable endurance under corrosive conditions. Malleable parts which have been under ground for years are still in excellent condition when other metal parts linking them have all but disintegrated. The same experience has occurred under severely corrosive atmospheric conditions such as salt sea air and locomotive smoke, etc.

When you need parts that will withstand corrosion as well as give strength and toughness — look into the possibilities of malleable iron. We can show you case histories that will confirm all of these statements and will be glad to have you discuss your problems with our experts.

SEE WHAT MALLEABLE IRON WILL DO FOR YOU.

GALT
MALLEABLE IRON
LIMITED
GALT ONTARIO

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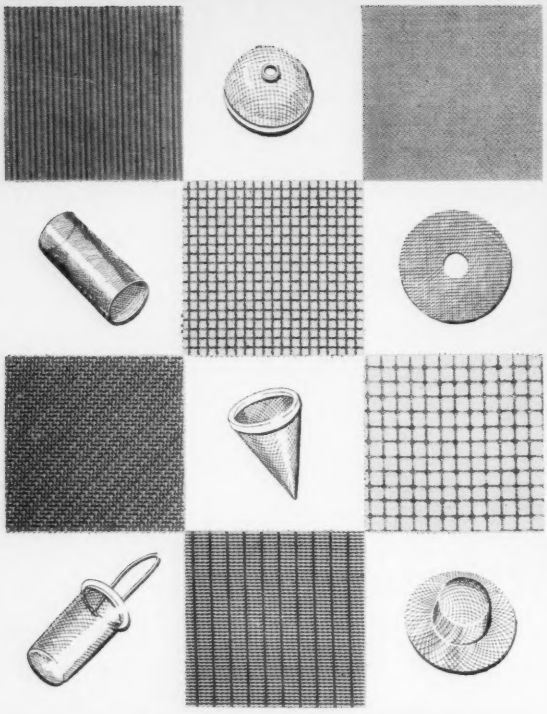

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of every type for every purpose!

Screening and perforated metals have a thousand different jobs to do in processing and manufacturing—and every job demands the right screen for top efficiency.

Greening keeps a wide assortment in stock to assure prompt delivery of the screen that will meet your needs exactly.

Materials include steel, aluminum, bronze, brass, copper, monel, inconel, nickel and stainless steels. Weaves include plain, twill and dutch. Metals are perforated in all commercial materials, gauges, and hole specifications.

To be sure you are using the best call Greening. Sales engineers will gladly give you the benefit of our long experience in selecting the right screen for your requirements.

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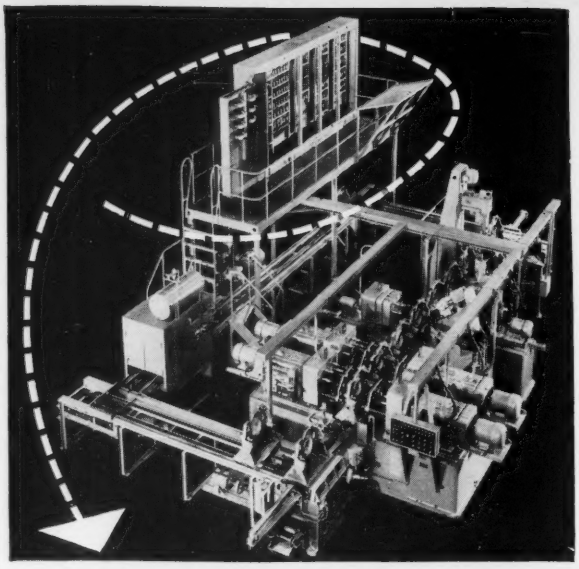
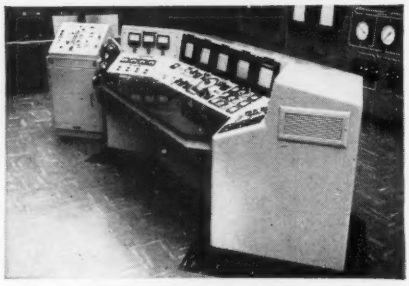


A complex control panel supplied by *Hammond* for this automation equipment built by Standard Modern Tools Ltd.

Consult HAMMOND

. . . at the design stage on ELECTRONIC-ELECTRICAL CABINETRY and METAL WORK



A Hammond built control console in use at Atomic Energy of Canada, Chalk River.

Hammond is equipped to produce intricate cabinetry and metal work related to the nucleonic, electronic and electrical industry.

The factory will be pleased to discuss *your* requirements on production runs, production prototypes or single units, and suggests that enquiries should originate at design level wherever possible.

A WIDE RANGE OF STANDARD CABINETS, PANELS AND CHASSIS STOCKED BY JOBBERS COAST TO COAST

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H/12 **Guelph • Ontario • Canada**

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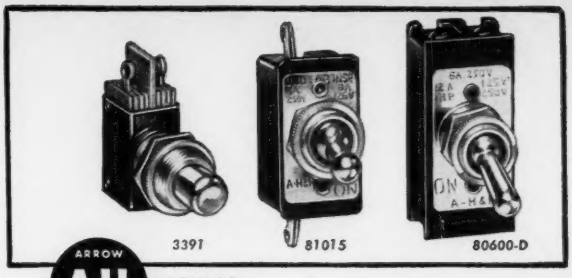

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Stronger . . . More Compact

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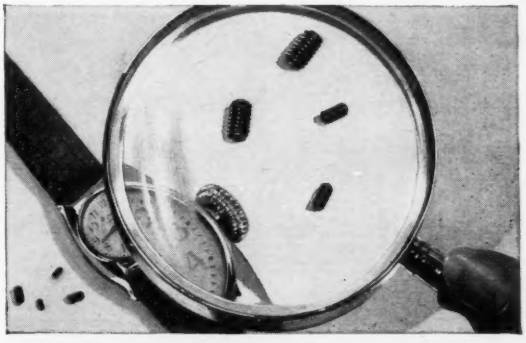

WORLD'S STRONGEST SOCKET DESIGN

Bristol Multiple-Spline Socket Screws incorporate basic engineering design . . . fundamental as the keyed shaft and collar . . . positive and non-slipping as meshed gears. The result is strength and holding power not equalled by any other screw. They withstand tremendous shock and vibration . . . can be set tighter, easier, faster. Bristol originated the multiple-spline socket screw over forty years ago and only at Bristol are they available in a full range of sizes from No. 0 wire size up. Write Bristol Socket Screw Division for samples and catalogue.

Precision Socket Screw Manufacturers Since 1913

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Editorial

A show, a symposium and spacemen

Look out next month for preview details of the 300 exhibits at the National Industrial Production Show of Canada to be held May 4-8 at Exhibition Park, Toronto. We shall spotlight items of particular interest to the design engineer.

Details will also be given of the 16 lectures (with the theme "Productivity via Welding") to be given at the second National Welding Convention to be held concurrently with that show for two days (May 5 and 6), and sponsored by the Canadian Welding Society.

Symposium on education in materials

Realizing what a lot there is for the engineering student to learn about the use of materials for reactors, rockets and space vehicles, the American Society for Engineering Education and the American Society for Testing Materials are jointly sponsoring a symposium on education in materials, June 22-26 in Atlantic City.

Different viewpoints will be heard, including those of ASTM, ASEE and leaders of industry.

The symposium will be concluded by a survey of the Degrees in materials engineering now under consideration by engineering schools.

Such men are these

We read the other day that over a hundred potential candidates in the U. S. have been selected for flight into orbit around the earth. The volunteers will be known as Mercury Astronauts. So we warn you not to be too shocked if one day you see an announcement like this in the paper:

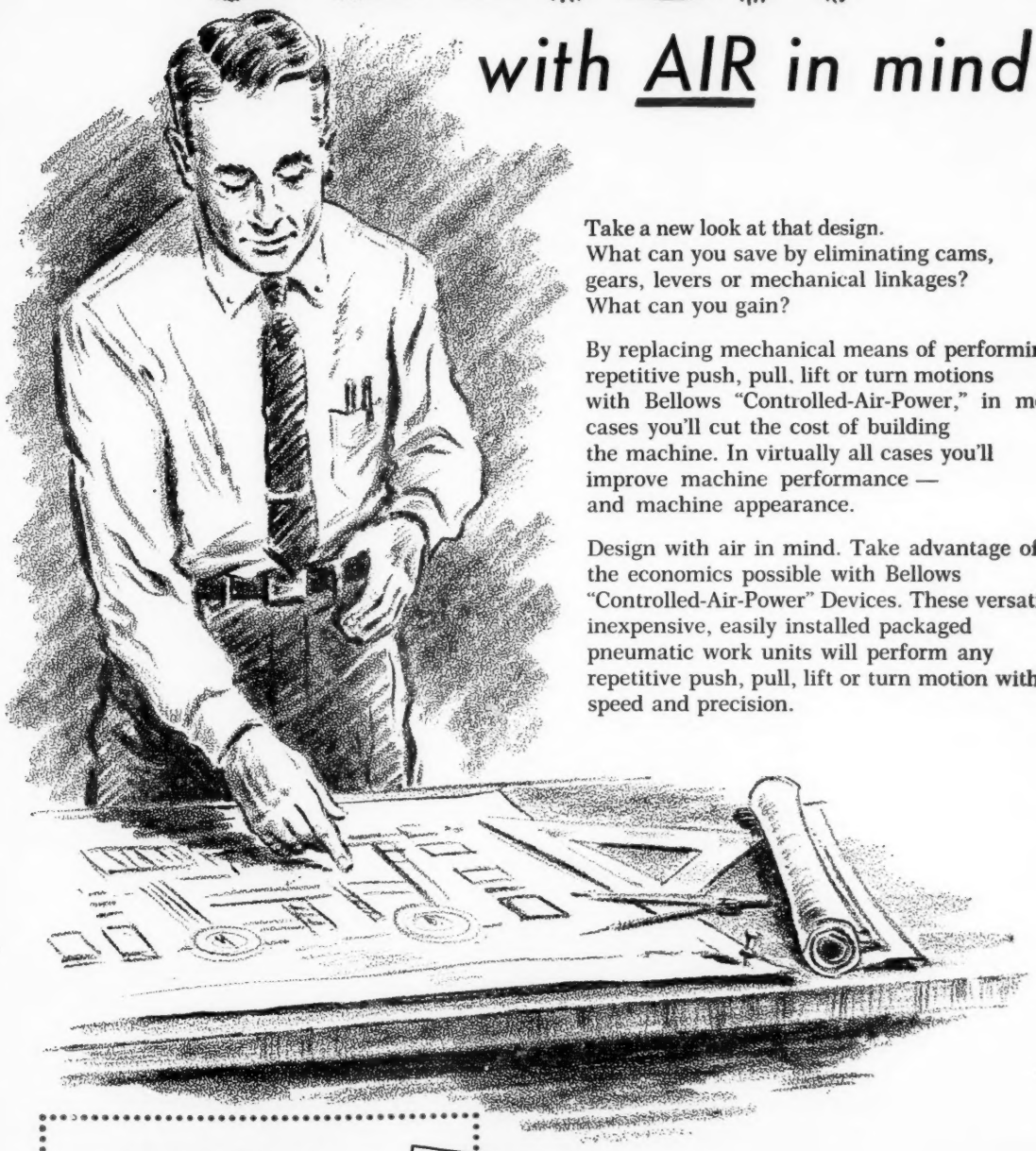
"Wanted—spacemen for outer terrestrial research.

Each candidate must have an honors degree in engineering, be a fully-qualified test pilot and have previous orbital experience. In addition to the above, only men over 7 ft tall, weightless and with a thorough grounding in lunitidal conduct will be considered. Salary: 28 space projection capsules per mission, plus all usual lunar fringe benefits."

William Morse.

DESIGN

with AIR in mind



Take a new look at that design. What can you save by eliminating cams, gears, levers or mechanical linkages? What can you gain?

By replacing mechanical means of performing repetitive push, pull, lift or turn motions with Bellows "Controlled-Air-Power," in most cases you'll cut the cost of building the machine. In virtually all cases you'll improve machine performance — and machine appearance.

Design with air in mind. Take advantage of the economics possible with Bellows "Controlled-Air-Power" Devices. These versatile, inexpensive, easily installed packaged pneumatic work units will perform any repetitive push, pull, lift or turn motion with speed and precision.

READ THIS STORY—

"The Place of the Bellows Air Motor in Original Equipment Design."

This new 14 page booklet will be of help to any design engineer.

Write Dept. DE 259
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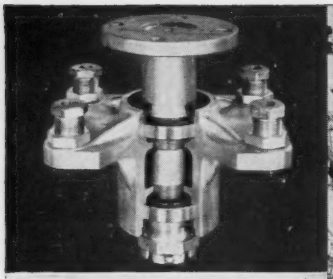
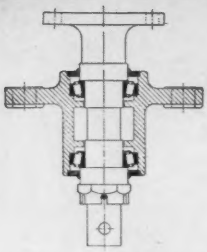
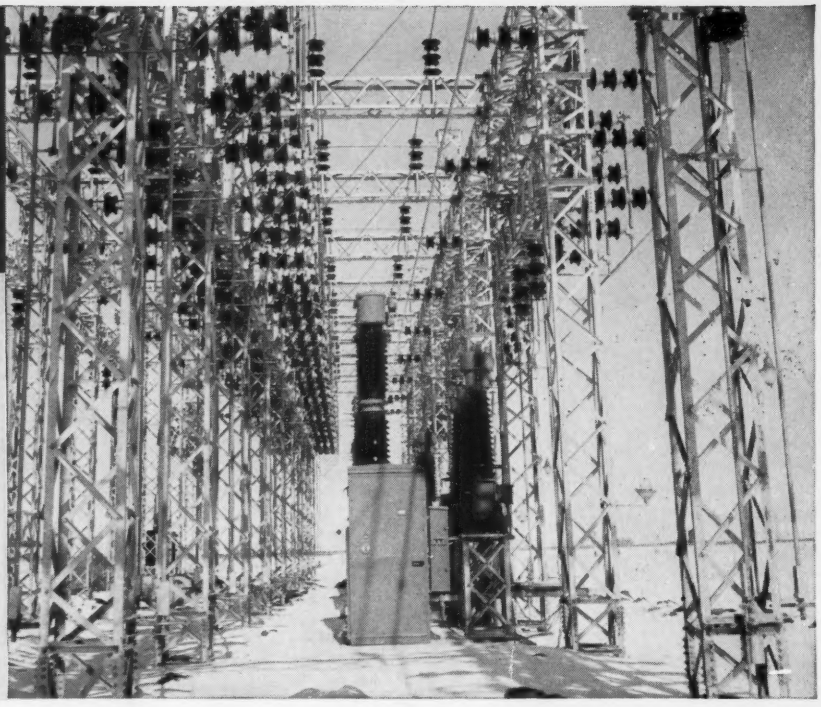




How **JAMES R. KEARNEY CORP. OF CANADA LTD.** mounts the base of its type KDHB outdoor disconnect switch on Timken bearings to assure positive performance, take heavy loads.



New switch in bearings! 230 TIMKEN bearings make right connections, under heavy loads, in any weather

THIS Kearney type KDHB disconnect switch does the vital job of making and breaking power circuits, making it possible to deliver power when and where needed. And it has to do it under all weather conditions—can't stick in snow or ice. All this, plus the heavy loads when the switches are mounted vertically or at an angle puts heavy demands on the bearings in the switch base. To assure trouble-free operation, James R. Kearney Corp. of Canada Ltd. specified two Timken tapered roller bearings for the rotating stack of each single pole switch. Some 30 three-pole switches are shown in the installation above.

Timken bearings assure easy switch rotation because they roll true, practically eliminate friction. Seizure won't occur. And they're adjustable—can be set to the most desirable setting for this kind of oscillating service. The taper and design of Timken bearings lets them take static as well as both radial and thrust loads in any combination. And full-line contact between rollers and races gives Timken bearings extra load-carrying capacity.

With Timken bearings closures are more effective, too. Dirt, dust and moisture stay out. Lubricant stays in. Condensation doesn't form to cause corrosion.

We even make our own electric furnace fine alloy steel, to be sure it's the best. For all these advantages, specify bearings trade-marked "Timken". The Timken Roller Bearing Company, Canton 6, Ohio, U. S. A. **CANADIAN PLANT:** St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *Made in* **CANADA**

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TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ⊡ AND THRUST →⊡← LOADS OR ANY COMBINATION →✳←

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